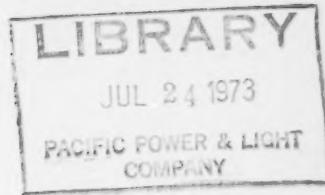


SELECTED  
WATER  
RESOURCES  
ABSTRACTS



VOLUME 6, NUMBER 13  
JULY 1, 1973

W73-07801 -- W73-08450



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# SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,  
Office of Water Resources Research, U.S. Department of the Interior



**VOLUME 6, NUMBER 13**  
**JULY 1, 1973**

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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1973.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

## FOREWORD

**Selected Water Resources Abstracts**, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus**. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

**Selected Water Resources Abstracts** is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by co-ordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

**Water Resources Scientific Information Center  
Office of Water Resources Research  
U.S. Department of the Interior  
Washington, D. C. 20240**

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Includes the following Groups: Properties; Aqueous Solutions and Suspensions

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# SELECTED WATER RESOURCES ABSTRACTS

## 01. NATURE OF WATER

### 1A. Properties

#### AN EXPERIMENTAL STUDY OF THE STRUCTURE, THERMODYNAMICS AND KINETIC BEHAVIOR OF WATER,

Midwest Research Inst., Kansas City, Mo.  
F. T. Greene, J. Beachey, and T. A. Milne.

Available from the National Technical Information Service a PB-214 974, \$3.00 in paper copy, \$1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 789, July 1972. 46 p, 26 fig, 3 tab, 9 ref. 14-01-0001-1479.

Descriptors: \*Thermodynamics, \*Water structure, \*Water properties, \*Thermodynamic behavior, \*Molecular structure, \*Hydrogen bonding, Kinetics, Polymers.

Identifiers: Mass spectrometers, Molecular beam technique, Equilibrium, Water dimers, Water trimers.

A combination of mass spectrometric and molecular beam techniques has been applied to the study of the equilibrium thermodynamics and the rates of formation of water clusters. Reliable equilibrium thermochemical data have been obtained for water dimer while preliminary data have been gathered for water trimer and several larger polymers. These results support a hydrogen bond strength in water of 5 kcal per mole. Extensive measurements were also made of the concentrations of several water clusters following the free-jet expansion of water vapor from higher pressures. These data contain unique kinetic information. A kinetic model for the formation of dimers in free-jet expansions has been developed and temperature dependent rate constants for the formation of argon dimer deduced. (OSW) W73-08188

### 1B. Aqueous Solutions and Suspensions

#### THERMOCHEMICAL INVESTIGATION OF DIMETHYLMERCURY IN AQUEOUS AND NONAQUEOUS SOLUTIONS,

Missouri Univ., Rolla. Dept. of Chemistry.  
For primary bibliographic entry see Field 05A.  
W73-07806

## 02. WATER CYCLE

### 2A. General

#### INTRODUCTION OF TIME VARIANCE TO LINEAR CONCEPTUAL CATCHMENT MODELS,

Institute of Hydrology, Wallingford (England).  
A. N. Mandeville, and T. O'Donnell.  
Water Resources Research, Vol 9, No 2, p 298-310, April 1973. 7 fig, 7 ref.

Descriptors: \*Rainfall-runoff relationships, \*Mathematical models, \*Unit hydrographs, \*Variability, Time series analysis, Runoff forecasting, Mathematical studies.

Time-variant versions of the usual linear conceptual models relating rainfall and runoff based on the linear channel and the linear reservoir are defined. Expressions are obtained for their impulse responses. The convolution integral is used both to study different combinations of the two basic time-variant components and to obtain the response of any time-variant linear system to a given input. The theoretical background of more advanced models is discussed and it is suggested

that time variance may be introduced into any linear model founded on these two conceptual components. (Knapp-USGS)  
W73-07885

#### DETERMINATION OF OPTIMAL KERNELS FOR SECOND-ORDER STATIONARY SURFACE RUNOFF SYSTEMS,

Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.  
M. H. Diskin, and A. Boneh.  
Water Resources Research, Vol 9, No 2, p 311-325, April 1973. 6 fig, 3 tab, 24 ref.

Descriptors: \*Rainfall-runoff relationships, \*Mathematical models, Systems analysis, Optimization, Streamflow forecasting, Runoff forecasting.

Discretization of input, output, and kernel functions of a second-order Volterra series representation of the surface runoff system leads to a set of linear equations for the unknown ordinates of the two-kernel functions. The equations may be solved by an iterative descent optimization procedure. The objective function for the optimization procedure is the sum of squared deviations between observed and predicted output ordinates for all storms included in the record. The constraining equations are included by an iterative scheme based on the penalty function method. The algorithm converges to the optimal solution in a finite number of iterations, and its rate of convergence is independent of initial values adopted for the unknowns. A numerical example based on an eight-storm record is included. (Knapp-USGS)  
W73-07886

#### STORM FLOW FROM HARDWOOD-FORESTED AND CLEARED WATERSHEDS IN NEW HAMPSHIRE,

Forest Service (USDA), Durham, N.H. Northeastern Forest Experiment Station.  
For primary bibliographic entry see Field 04C.  
W73-07889

#### MEASURE OF THREE-DIMENSIONAL DRAINAGE BASIN FORM,

Cambridge Univ. (England). Dept. of Geography.  
M. G. Anderson.  
Water Resources Research, Vol 9, No 2, p 378-383, April 1973. 3 fig, 1 tab, 19 ref.

Descriptors: \*Terrain analysis, \*Maps, \*Mapping, \*Topography, \*Watersheds (Basins), Geomorphology, Topographic mapping, Valleys, Slopes, Small watersheds, River basins, Channel morphology.  
Identifiers: \*Map analysis.

The form of a small basin can be generated from a minimum of six coefficients derived from map analysis. The coefficients are: A, area; l, length of the basin; G, gradient of the mainstream; and 3, polynomial coefficients. The model reproduces correctly the important characteristics of surface roughness and spatial autocorrelation. (Knapp-USGS)  
W73-07892

#### MODELING INFILTRATION DURING A STEADY RAIN,

Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.  
For primary bibliographic entry see Field 02G.  
W73-07893

#### MULTISITE DAILY FLOW GENERATOR,

Department of the Environment, Ottawa (Ontario). Water Management Service.  
R. L. Pentland, and D. R. Cuthbert.

Water Resources Research, Vol 9, No 2, p 470-473, April 1973. 2 fig, 7 ref.

Descriptors: \*Simulation analysis, \*Statistical methods, \*Streamflow forecasting, Canada, Regression analysis, Hydrograph analysis, Flood forecasting, Synthetic hydrology.  
Identifiers: \*Fraser River (Canada).

A daily flow generation model was developed to synthesize correlated flood hydrographs on the main stem and tributaries of a large river system. Statistical parameters on which the synthetic data are based are derived from historical data. The historical data are first subjected to a logarithmic transform, and regression equations are established between the monthly totals and the standard deviations of the flow logarithms for each calendar month of interest. These relationships are used later in the procedure for standardizing the generated data so that flow variability will be related to the monthly mean to the extent that it is related in nature. Before serial correlation relationships are derived, the historical data are also standardized (by subtracting the long-term mean and dividing by the standard deviation) and normalized by using a Pearson type 3 transform. (Knapp-USGS)  
W73-07899

#### STUDIES ON THE FLUVIAL ENVIRONMENT, ARCTIC COASTAL PLAIN PROVINCE, NORTHERN ALASKA, VOLUMES I AND II.

For primary bibliographic entry see Field 02C.  
W73-07906

#### WATER RESOURCES OF LAND AREAS (POR-MIROVANIYE RESURSOV VOD SUSHI).

Izdatel'stvo 'Nauka', Moscow, G. P. Kalinin, editor, 1972. 136 p.

Descriptors: \*Hydrology, \*Water resources, \*Land, Water types, Water levels, Runoff, Streamflow, Surface-groundwater relationships, Water storage, Water balance, Evaporation, Precipitation (Atmospheric), Air temperature, Heat balance, Soil types, Infiltration, Water quality, Model studies, Variability, Maps.  
Identifiers: \*USSR, Continental hydrology.

This collection, published by the USSR Academy of Sciences' Institute of Water Problems, contains 9 papers devoted to investigations of the relationships between oceanic water and water of continental land masses, surface waters and groundwater, and heat and water balances. The subjects of the individual papers are: (1) variability of annual atmospheric precipitation and air temperature in Europe and North America; (2) variations in secular sea levels; (3) use of space-time characteristics of runoff variability for extrapolation; (4) space-time distribution of surface-groundwater relationships; (5) infiltration of melt water into soil; (6) application of a statistical model of infiltration to water-quality analysis; (7) relation between heat and water balances in European Russia in connection with redistribution of streamflow; (8) water-balance investigations of irrigated soils between periods of irrigation; and (9) minimum discharge in rivers of Iraq. (Josefson-USGS)  
W73-07910

#### WATER TEMPERATURE VARIATIONS IN THE NORTH ATLANTIC IN 1948-1968,

Leningrad Higher School of Marine Engineering (USSR).  
A. A. Zverev.  
Oceanology, Vol 12, No 2, p 182-186, 1972. 3 fig, 2 tab, 4 ref. Translated from Okeanologiya (USSR), Vol 12, No 2, 1972.

## Field 02—WATER CYCLE

### Group 2A—General

Descriptors: \*Oceanography, \*Atlantic Ocean, \*Water temperature, \*Variability, Fluctuations, Meteorology, Equations.

Identifiers: \*USSR, Ocean weather stations.

Long-period variations in water temperature anomalies in the North Atlantic were analyzed from weather ship data collected in 1948-68. Between 1948 and 1953, average water temperature for all ocean weather stations in the area increased from minus 0.42 deg C to plus 0.36 deg C, or by 0.78 deg C. Between 1953 and 1963, the water temperature decreased by 0.48 deg C (from plus 0.36 deg C to minus 0.12 deg C), followed by a slight increase in 1964-66. Changes in water temperature reveal long-period variations on which sharp short-period fluctuations are superimposed. The change in sea temperatures in the North Atlantic exhibits an opposite (mirror image) pattern in western and northern regions. (Josefson-USGS) W73-07914

#### INSTANTANEOUS UNIT HYDROGRAPHS, PEAK DISCHARGES AND TIME LAGS IN URBANIZING WATERSHEDS,

Purdue Univ., Lafayette, Ind. School of Civil Engineering.

R. A. Rao, and J. W. Delleur.

Research report, (1972). 7 fig, 3 tab, 28 equ, 20 ref.

OWRR-B-002-IND (3).

Descriptors: \*Urban hydrology, \*Watersheds (Basins), \*Unit hydrographs, \*Runoff, Analytical techniques, Estimating, Time lag, Peak discharge, Floods, Hydrologic data, Reservoirs, Equations, Mathematical models, Regression analysis, Rainfall-runoff relationships.

Identifiers: Physiographic characteristics, Storm characteristics, Fourier transform method, Single linear reservoir method.

Aspects of investigating the effects of urbanization on runoff by using the Instantaneous Unit Hydrograph (IUH), and aspects of analysis of magnitudes and times to peaks of annual maximum floods are discussed. The effects of urbanization of a watershed on the runoff has been investigated in the past by using linear conceptual models in which the time lag appears as an important parameter. However, in this approach the effects of noise in the data, of sampling rate, and of errors due to the lack of synchronization between the effective rainfall and runoff on the instantaneous unit hydrograph do not become readily apparent. A case in which the cumulative effect of these factors is predominant is presented as an example of the possible difficulties which might be encountered in the analysis of urban hydrologic data by the unit hydrograph methods. The disadvantages of relating the peak discharge, the time to peak discharge and the time lag to only the physiographic characteristics are discussed. Alternative regression relationships which involve storm characteristics along with the physiographic characteristics to estimate the peak discharge, time to peak discharge, and time lag are presented. (Bell-Cornell) W73-07917

#### WATER-RESOURCES RECONNAISSANCE OF THE OZARK PLATEAUS PROVINCE, NORTHERN ARKANSAS,

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 07C.

W73-08069

#### SEPARATION OF THE SURFACE AND SUB-SURFACE FLOW FROM SNOWMELT BY THE USE OF RADIOACTIVE TRACERS,

Department of the Environment (Alberta). Water Resources Div.

For primary bibliographic entry see Field 02C.

W73-08146

#### INFLUENCE OF LATE SEASON PRECIPITATION ON RUNOFF OF THE KINGS RIVER, SIERRA HYDROTECHNOLOGY, PLACERVILLE, CALIF.

J. F. Hannaford.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972. Phoenix, Ariz.: Printed by Colorado State University, Fort Collins, p 67-74, 1972. 9 fig, 3 ref.

Descriptors: \*Mathematical models, \*Water yield, \*Hydrograph analysis, \*Snowmelt, \*Rainfall-runoff relationships, Base flow, Data collections, Meteorological data, Climatic data, \*California, Storms, Precipitation (Atmospheric).

Identifiers: \*Kings River (Calif), \*Sierra Nevada (Calif).

In the Kings River basin of the southern Sierra Nevadas, late-season, high-elevation storms are important factors in the hydrology of the area. Numerous occurrences producing from a few hundred to perhaps 10,000 acrefeet or more may be expected to occur almost every year. In aggregate they may represent from five to twenty percent of the total runoff in the May-September period. While the supplemental water produced by late-season precipitation cannot be accurately forecast, accurate knowledge of the quantity and timing of such supplemental flow would be valuable to the water manager. Recent studies involving weather modification during the May-September period suggest that perhaps substantial augmentation of runoff from late season storms may be a possibility. (See also W73-08138) (Knapp-USGS) W73-08083

A method is presented for investigating the atmospheric energy budget as related to cyclogenesis. Energy budget equations represent basic physical processes which produce changes in atmospheric energy and provide a means to study the interaction of the cyclone with the larger scales of motion. An extension of previous studies is presented. Computations are carried out over a limited atmospheric volume which encompasses the cyclone, and boundary fluxes of energy that were ignored in most previous studies are evaluated. Two examples of cyclogenesis over the eastern United States were chosen for study. Results indicate that diabatic processes can be a significant factor in the development of a cyclone; the downward transport of kinetic energy from the jet-stream level can be an important source of energy for a developing cyclone; and there is considerable interaction between a cyclone and its environment. (Woodard-USGS) W73-08083

#### TRANSPOSITION OF STORMS FOR ESTIMATING FLOOD PROBABILITY DISTRIBUTIONS,

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

For primary bibliographic entry see Field 02E.

W73-08085

#### PROCEEDINGS OF THE WESTERN SNOW CONFERENCE,

For primary bibliographic entry see Field 02C.

W73-08138

#### A PLAN FOR STUDY OF WATER RESOURCES IN THE PLATTE RIVER BASIN, NEBRASKA—WITH SPECIAL EMPHASIS ON THE STREAM-AQUIFER RELATIONS,

Geological Survey, Lincoln, Nebr. Water Resources Div.

C. F. Keech, J. E. Moore, and P. A. Emery. Geological Survey open-file report, January 1973. 36 p, 3 fig, 57 ref.

Descriptors: \*Surface-groundwater relationships, \*Mathematical models, \*Nebraska, Hydrogeology, Water resources development.

Identifiers: \*Platte River (Nebr).

A study is being made of the Platte River basin in Nebraska. The study is a federal and state interagency effort to formulate a comprehensive plan for the conservation, development, and management of the water and related land resources of the Platte River basin. A quantitative description of the operation of the hydrologic system emphasizes the relation of groundwater to surface water. A digital model will simulate the physical character and operation of the stream-aquifer system. Some of the uses of the model are evaluation of effects of proposed conjunctive use projects, effects of changes in water use, and study of future water problems such as water-logged areas, groundwater mining, and streamflow depletion. (Knapp-USGS) W73-08357

THE LABOR DAY STORM OF 1970 IN ARIZONA,

Arizona Univ., Tucson. Dept. of Watershed Management.

D. B. Thorud, and P. F. Pfolliott.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972. Phoenix, Ariz.: Printed by Colorado State University, Fort Collins, p 37-42, 1972. 2 fig, 9 ref.

Descriptors: \*Floods, \*Storms, \*Arizona, \*Tropical cyclones, Meteorology, Climatology, Disasters, Erosion, Storm structure, Weather patterns, Flood forecasting.

The 1970 Labor Day storm caused more loss of life than any other storm in Arizona's recent history. The storm began on September 2nd, when moist air, associated with tropical storm Norma, flowed into Arizona from the Pacific Ocean and the Gulf of California. During the next two days the air mass reached sufficient depth to allow the formation of thunderstorms. A convergent flow of air in the lower atmosphere over southern Arizona on the 4th caused heavy rainfall. This rainfall ended late on the 4th. On the morning of the 5th, a cold front extended from southwestern Utah into southern Nevada, and an associated deep upper trough was located over Nevada and southern California. In advance of the cold front, a surface trough extended from Las Vegas, Nevada, to Palm Springs, California. Strong, southerly winds developed early on the 5th. Orographic rainfall increased sharply over the mountains of central Arizona as the trough approached. A combination of the advancing trough and normal daytime heating generated lines of thunderstorms by midafternoon. The heavy rainfall brought flooding throughout central and northeastern Arizona, southeastern Utah and southwestern Colorado. (See also W73-08138) (Knapp-USGS) W73-08145

## WATER CYCLE—Field 02

### Snow, Ice, and Frost—Group 2C

#### WATERSHED HYDROMETEOROLOGICAL DATA REQUIRED FOR WEATHER MODIFICATION, North American Weather Consultants, Santa Barbara, Calif.

For primary bibliographic entry see Field 03B.  
W73-08150

#### THE BOREAL BIOCLIMATES, Toronto Univ., (Ontario). Dept. of Geography.

F. K. Hare, and J. C. Ritchie.  
Geogr Rev. Vol 62, No 3, p 335-365. 1972. Illus.  
Identifiers: \*Albedo, \*Bio climates, \*Boreal, Climates, Energy, Forests, Tundra, Woodland, \*Remote sensing.

The long-established zonal divisions of the boreal forest (forest-tundra, open woodland and closed forest) are examined in the light of new information about energy income and of satellite photographs of the divisions themselves. The North American divisions are found to lie fairly consistently between certain values of mean annual net radiation, but these values are much influenced by the vegetation structure because of the importance of snow cover in determining spring albedo. The phytomass and net production data from the Bazzivish-Rodin synthesis are examined in the light of energy income. Efficiency of energy conversion (all-wave) varies from below 0.5% in the tundra to 1.2% or above in the closed forest.—Copyright 1973, Biological Abstracts, Inc.  
W73-08437

## 2C. Snow, Ice, and Frost

#### HEAT AND MASS TRANSFER OF FREEZING WATER-SOIL SYSTEM,

British Columbia Univ., Vancouver. Dept. of Chemical Engineering.

G. F. Kennedy, and J. Lielmezs.

Water Resources Research, Vol 9, No 2, p 395-400, April 1973. 7 fig, 9 ref.

Identifiers: \*Freezing, \*Frozen soils, \*Frost, \*Mass transfer, \*Heat transfer, Water chemistry, Soil water, Soil water movement, Flow, Convection, Diffusion, Thermodynamics.

Equations are given to describe fluxes of heat and mass, and transfer potential distributions for temperature and moisture content for a freezing soil system. Within a given set of physical and mathematical restrictions the derived equations will account for transient conditions, multiphase systems, phase changes, and multietensive property transfers. The development of these transfer equations involves defining the system and stating the physical conditions, developing conservation equations, developing flux equations subject to the proper use of the principles of thermodynamics of irreversible processes (linearized Onsager flux equations), and combining conservation and flux equations to yield the transfer equation. (Knapp-USGS)  
W73-07894

#### SPRING DISCHARGE OF AN ARCTIC RIVER DETERMINED FROM SALINITY MEASUREMENTS BENEATH SEA ICE.

Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

H. J. Walker.

Water Resources Research, Vol 9, No 2, p 474-480, April 1973. 4 fig, 3 tab, 15 ref. ONR Contract N00014-69-A-0211-0003.

Identifiers: \*Discharge measurement, \*Streamflow, \*Alaska, \*Ice breakup, \*Sea ice, Mixing, Salinity, Stream gages, Discharge (Water), Permafrost, Arctic.

Identifiers: \*Colville River (Alaska).

Salinity measurements under sea ice seaward of the Colville delta in Alaska made possible the calculation of the river's discharge during breakup in 1971. Between May 27 and June 15 the discharge was 5.70 billion cu m, which is about 58% of the total for 1971. The entire drainage basin of the Colville River is confined to the zone of continuous permafrost. In winter both surface water and groundwater freeze, and the river ceases to flow. This cessation of flow allows seawater to occupy completely the delta front and to replace river water in the lower reaches of the river. After flushing the saltwater from the river channels, the floodwater intrudes between sea ice and seawater as it flows into the ocean. (Knapp-USGS)  
W73-07900

#### GLAZE AND RIME (GOLOLED I IZMOROZ'), Ye. P. Dranovich.

Gidrometeoizdat, Leningrad, 1971. 228 p.

Descriptors: \*Sleet, \*Rime, \*Meteorology, \*Atmospheric physics, \*Ice, Freezing, Dew, Humidity, Water vapor, Wind velocity, Snow, Rain, Fog, Physical properties, Topography, Maps, Synoptic analysis, Weather data, Isotherms, Forecasting.

Identifiers: \*USSR, \*Glaze (Ice), Hoarfrost.

Meteorological and synoptic conditions of formation and space-time distribution of glaze (sleet) and rime were investigated in the Leningrad, Novgorod, and Pskov Oblasts in Northwest USSR. The effects of topography on frequency, duration, and extent of glaze and rime phenomena are examined, and a detailed analysis is made of cases of especially dangerous ice deposits. Techniques for forecasting ice accretion on ground surfaces and formation of glaze zones associated with moving warm fronts are accompanied by a map showing the areal distribution of glaze and freezing rain. (Josefson-USGS)  
W73-07902

#### STUDIES ON THE FLUVIAL ENVIRONMENT, ARCTIC COASTAL PLAIN PROVINCE, NORTHERN ALASKA, VOLUMES I AND II, R. I. Lewellen.

Available from NTIS, Springfield, Va 22151 Vol I-AD-74 9150 Price \$6.00 printed copy; Vol II-AD-74 9151 Price \$3.00 printed copy, \$1.45 microfiche each. Robert I. Lewellen, Littleton, Colorado, 1972. 282 p, 208 fig, 90 tab, 245 ref, 6 append.

Descriptors: \*Geomorphology, \*Coastal plains, \*Alaska, \*Arctic, Fluvial sediments, Geologic formations, Surveys, Hydrologic data, Data collections, Ice, Streamflow, Stream gages, Sediment transport, Geology, Climatic data, Seasonal, Thawing, Soils, Frozen ground, Melting, Runoff, Tidal effects, Shores, Erosion, Meteorological data, Water chemistry, Vegetation, Hydrographs, Maps, Photography, Data processing.

Identifiers: \*Arctic Coastal Plain Province (Northern Alaska).

Studies on the fluvial environment of the Arctic Coastal Plain Province, Northern Alaska, include research which ranges in magnitude from small polygon troughs to the Inari River Basin. The 208 figures include stereograms, ground and aerial photographs, graphs, curves, and maps. Ninety tables appear in the publication. Complete hydrographs for two tundra streams are included. Discussions include soil subsidence, soil consolidation, details of specific study sites and the findings, and a section on the Late Pleistocene and Recent. Instrumentation, methods, and the uses of aerial photography are included. Over 240 bibliographic entries provide references and a foundation for future research. Chronologies of physical events which occurred in the drainage basins are listed. Basic statistics and reproductions of computer printouts of the microclimatic data are presented in the Appendices. The information (contained in 2 volumes) provides a guide to

management and developers and can be utilized as engineering criteria. (Woodard-USGS)  
W73-07906

#### THE WEAR OF SANDSTONE BY COLD, SLIDING ICE, Newcastle-upon-Tyne Univ. (England). Dept. of Geography.

For primary bibliographic entry see Field 02J.  
W73-08074

#### TORS, ROCK WEATHERING AND CLIMATE IN SOUTHERN VICTORIA LAND, ANTARCTICA, Keele Univ. (England). Dept. of Geography.

For primary bibliographic entry see Field 02J.  
W73-08075

#### VALLEY ASYMMETRY AND SLOPE FORMS OF A PERMAFROST AREA IN THE NORTHWEST TERRITORIES, CANADA, Cambridge Univ. (England). Dept. of Geography.

B. A. Kennedy, and M. A. Melton.  
In: Polar Geomorphology; Institute of British Geographers Special Publication No 4, p 107-121, June 1972. 6 fig, 4 tab, 24 ref. US Army Grant D-ARO-D-31-124-G939.

Descriptors: \*Geomorphology, \*Arctic, \*Erosion, \*Mass wasting, \*Valleys, \*Permafrost, Profiles, Slopes, Topography, Degradation (Slope), Snow cover, Creep, Solifluction, Freezing, Thawing.

Valley asymmetry and slope forms in a small area of sedimentary rocks adjacent to the Mackenzie River delta are related to the major variations in climate, available relief, and geomorphic processes. The area is greatly varied geomorphologically and it does not fit the classic periglacial pattern. Asymmetry in maximum slope angles reverses between (a) areas of more severe climate and low available relief—where north-facing slopes are significantly steeper than those facing south, and (b) the zone of milder climate and deeper valleys, where south-facing slopes are the steeper. Slopes that are directly under the control of fluvial erosion show less response to differences in the degree of basal corrosion than to variations in aspect. This is unlike nonpermafrost areas. (Knapp-USGS)  
W73-08076

#### THE NATURE OF THE ICE-FOOT ON THE BEACHES OF RADSTOCK BAY, SOUTH-WEST DEVON ISLAND, N.W.T., CANADA IN THE SPRING AND SUMMER OF 1970, McMaster Univ., Hamilton (Ontario). Dept. of Geography.

S. B. McCann, and R. J. Carlisle.  
In: Polar Geomorphology; Institute of British Geographers Special Publication No 4, p 175-186, June 1972. 6 fig, 14 ref.

Descriptors: \*Sea ice, \*Beaches, \*Arctic, Melting, Ice breakup, Canada, Geomorphology, Beach erosion, Ice, Waves (Water), Surf, Ablation.

Identifiers: \*Ice foot (Beaches), \*Devon Island (Canada).

The ice foot is that part of the sea ice which is frozen to the shore and is therefore unaffected by tidal movements. The ice foot present along the coast of southwest Devon Island, Canada, in the early summer of 1970 is described and series of profiles across the feature, surveyed at intervals during the period of breakup, are presented. The form of the ice foot along Radstock Bay in the spring and summer of 1970 was the most pronounced observed in three seasons of field work on the coast of southwest Devon Island. The size and extent of the ice foot in any year clearly depend on the sea conditions existing at the time of freezing in the previous autumn. The 1970 ice

## Field 02—WATER CYCLE

### Group 2C—Snow, Ice, and Frost

foot originated in conditions of medium-sized waves for the area. As there were only a few floes included in the ice foot and little evidence of buckling, the bay was relatively ice-free at the time of ice-foot formation, probably in mid- or late October 1969. The control of beach slope on ice-foot width and thickness, as seen in the Radstock Bay measurements, is such that as slope increases so the width and thickness of the ice foot decrease. Erosion of channels by water draining seaward from the melting snow in the backshore zone, early in the season, is important in breaching the ice foot. The sea ice had moved out of the outer part of Radstock Bay, adjacent to the study beach, by August 9, and the ice foot had been ablated and eroded away by August 15. (Knapp-USGS)  
W73-08080

**PROCESS AND SEDIMENT SIZE ARRANGEMENT ON HIGH ARCTIC TALUS, SOUTHWEST DEVON ISLAND, N.W.T., CANADA.**  
Alberta Univ., Edmonton. Dept. of Geography.  
For primary bibliographic entry see Field 02J.  
W73-08090

**NATURE AND RATE OF BASAL TILL DEPOSITION IN A STAGNATING ICE MASS, BURROUGHS GLACIER, ALASKA,**  
Ohio State Univ. Research Foundation, Columbus.  
Inst. of Polar Studies.  
For primary bibliographic entry see Field 02J.  
W73-08091

#### PROCEEDINGS OF THE WESTERN SNOW CONFERENCE

Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, 1972. 88 p.

Descriptors: \*Snow, \*Water resources, \*Conferences, \*Water resources development, Weather modification, Urbanization, Conservation, Water supply.

Recent feeling about the environment as it concerns the snow resource is changing with the spirit of the times. This is the keynote of the Seminar on 'Environment and the Snow Resource,' given in the 40th annual Western Snow Conference. The basic water and snow resource is not changing, but man's influence on this resource is producing change. In the case of urbanization, the effects of man on natural patterns of water supply may be largely inadvertent and often harmful, but man's intentional activities may often improve the environment to yield either more direct benefit to water users or greater aesthetic and recreational advantages. (See W73-08139 thru W73-08154) (Knapp-USGS)  
W73-08138

**COPING WITH POPULATION GROWTH AND A LIMITED RESOURCE,**  
Arizona Water Commission, Phoenix.  
For primary bibliographic entry see Field 06A.  
W73-08140

**RENOVATING SEWAGE EFFLUENT BY GROUNDWATER RECHARGE,**  
Agricultural Research Service, Phoenix, Ariz.  
Water Conservation Lab.  
For primary bibliographic entry see Field 05D.  
W73-08141

**THE APPLICATION OF SNOWMELT FORECASTING TO COMBAT COLUMBIA**

#### RIVER NITROGEN SUPERSATURATION PROBLEMS,

Corps of Engineers, Portland, Oreg. North Pacific Div.

D. D. Speers.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, p 17-22, 1972. 6 fig, 5 ref.

Descriptors: \*Reservoir operation, \*Columbia River, \*Nitrogen, \*Snowmelt, \*Streamflow forecasting, Simulation analysis, Fish management, Fisheries, Reservoir releases, Water quality, Water quality control.

Identifiers: Columbia River basin.

Nitrogen supersaturation on the Columbia River causes fishery losses. The cause of nitrogen supersaturation and its effect on fish are reviewed. An effective means of reducing the problem is regulation of upstream reservoirs, and snowmelt forecasting plays an important role in this regulation. Two types of forecasts are utilized; volumetric forecasts determined by multiple regression procedures, and daily simulation of runoff using the SSARR computer model. These procedures are briefly described and examples of their application in combating the nitrogen supersaturation problem are given. (See also W73-08138) (Knapp-USGS)  
W73-08142

#### FORECAST STUDY FOR PRAIRIE PROVINCES WATER BOARD,

Water Survey of Canada, Calgary (Alberta). Alberta and Northwest Territories District Office.

For primary bibliographic entry see Field 04A.

W73-08143

**AIR TEMPERATURE OBSERVATIONS AND FORECASTS—THEIR RELATIONSHIP TO THE PREDICTION OF SPRING SNOWMELT IN THE EAGLE RIVER BASIN, COLORADO,**  
National Weather Service, Salt Lake City, Utah. River Forecast Center.

A. L. Zimmerman.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, p 30-36, 1972. 4 fig, 7 ref.

Descriptors: \*Snowmelt, \*Streamflow forecasting, \*Weather data, Snowpacks, Temperature, Data collections, Meteorology, \*Colorado.

Identifiers: \*Eagle River basin (Colorado).

A simple temperature index to snowmelt based on daily maximum temperature performs quite well in the Eagle River basin in Colorado in the spring snowmelt season during clear-weather melt conditions. During weather situations involving a significant change of air mass, air temperature is likely to be a poorer index to snowmelt than during relatively stable, dry periods. Therefore, additional air temperature data for a given river basin might not significantly improve snowmelt prediction during such periods. The predictability of air temperatures in a time frame of several days improves as the general circulation prognosis improves. (See also W73-08138) (Knapp-USGS)  
W73-08144

**THE LABOR DAY STORM OF 1970 IN ARIZONA,**  
Arizona Univ., Tucson. Dept. of Watershed Management.

For primary bibliographic entry see Field 02B.

W73-08145

#### SEPARATION OF THE SURFACE AND SUBSURFACE FLOW FROM SNOWMELT BY THE USE OF RADIOACTIVE TRACERS,

Department of the Environment (Alberta). Water Resources Div.

G. R. Holecek, and A. A. Noujaim.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, p 43-48, 1972. 3 fig, 2 tab, 5 ref.

Descriptors: \*Snowmelt, \*Surface runoff, \*Subsurface runoff, \*Tracers, \*Tracking techniques, Water yield, Radioisotopes, Radioactivity techniques, Piezometers, Surface-groundwater relationships, Soil water movement, Recharge, Water balance, Hydrograph analysis, Recession curves.

The separation of surface and subsurface flow resulting from snowmelt from a 15 acre plot in North-Central Alberta was accomplished by means of a radioisotope tracer. The snow cover was sprayed with 50 to 150 millicuries of Iodine-125. Surface flow retained its radioactive characteristic while the subsurface flows lost its contamination because of filtering action by the soil mantle. This method can be used to study the impact of land utilization on the hydrologic cycle. (See also W73-08138) (Knapp-USGS)  
W73-08146

#### SNOW, RELATED ACTIVITIES AND CONCERN ON THE GRAND MESA, WESTERN COLORADO,

Forest Service (USDA), Delta, Colo. Grand Mesa Uncompahgre National Forests.

J. J. Christner.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, p 49-52, 1972. 4 ref.

Descriptors: \*Snowpacks, \*Snow cover, \*Winter sports, Skiing, Recreation, Environmental effects, Snowmelt, Water yield, Water conservation, \*Colorado.

Identifiers: \*Grand Mesa (Colo), \*Snowmobiling.

Melt water from accumulated snow on the Grand Mesa plays a very important role in the agriculture of western Colorado. The recent large increase in people engaging in wintertime on-the-snow activities has resulted in the altering of snow redistribution patterns and the changing of snow density. The effects of these changes on forest and range ecosystems are largely unknown. Further studies are required to evaluate the changes that are occurring. (See also W73-08138) (Knapp-USGS)  
W73-08147

#### A WILDERNESS SNOW COURSE,

Forest Service (USDA), Kalispell, Mont. Flathead National Forest.

R. Dell.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, p 53-57, 1972. 1 fig, 1 tab, 5 ref.

Descriptors: \*Snow surveys, \*Montana, \*Runoff forecasting, Snowpacks, Forests, Forest watersheds, Land use.

Identifiers: \*Wilderness areas, \*Bob Marshall Wilderness Area (Mont).

The Holbrook Snow Course, located in the Bob Marshall Wilderness area, Flathead National Forest, Montana, has become the focal point of controversy concerning the use of motorized vehicles in wilderness areas. Travel to Holbrook was by fixed-wing aircraft and helicopter from 1951 through 1969, and beginning on March 1, 1970, by Forest Service personnel traveling to the area on skis. The Wilderness Act of 1964 (PL-88-577),

## WATER CYCLE—Field 02

### Snow, Ice, and Frost—Group 2C

which requires use of 'primitive' means of travel, and its relation to wilderness snow courses are discussed. Problems and hazards encountered during the ski trips are discussed. The importance of the snow course and the value of the wilderness resource are evaluated. A plan to move the course to another site in an attempt to consolidate administrative uses in the Wilderness area is also presented. This plan has resulted in a problem of data correlation which has not yet been solved. (See also W73-08138) (Knapp-USGS)  
W73-08148

**WILDERNESS IN THE NATIONAL PARKS,**  
National Park Service, Denver, Colo. Denver Service Center.  
For primary bibliographic entry see Field 04C.  
W73-08149

**WATERSHED HYDROMETEOROLOGICAL DATA REQUIRED FOR WEATHER MODIFICATION,**  
North American Weather Consultants, Santa Barbara, Calif.  
For primary bibliographic entry see Field 03B.  
W73-08150

**INFLUENCE OF LATE SEASON PRECIPITATION ON RUNOFF OF THE KINGS RIVER,**  
Sierra Hydrotechnology, Placerville, Calif.  
For primary bibliographic entry see Field 02A.  
W73-08151

**AVANLANCHE AWARENESS AND SAFETY FOR SNOW SCIENTISTS IN THE FIELD,**  
Geological Survey, Sacramento, Calif.  
W. R. Hotchkiss.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, p 75-80, 1972. 1 fig.

Descriptors: \*Avalanches, \*Snow surveys, \*Safety, Hazards, Snow management, Geomorphology.

During the winter of 1970-71, avalanches in the United States caught 58 people, buried 46, and killed 12. Snow scientists should periodically update their knowledge of how to classify avalanche events and to evaluate avalanche hazards. A practical, three-part classification of avalanches is proposed. Part I includes static observations made following the event; Part II includes dynamic observations made at the time of the event; and Part III includes genetic deductions based on a description of the meteorological background. Evaluation of hazard is possible through careful observation of the definitive factors which cause avalanches: accumulation of newly fallen and wind-transported snow, free water percolating through the snowpack, and progressive weakening of internal layers of the snowpack. Knowledge of avalanche classification and hazard evaluation together with the use of sound judgment should promote avalanche awareness and safety. (See also W73-08138) (Knapp-USGS)  
W73-08152

**SECTION 22, 'SNOW SURVEY AND WATER SUPPLY FORECASTING,' OF THE SCS NATIONAL ENGINEERING HANDBOOK,**  
Soil Conservation Service, Portland, Oreg. Water Supply Forecast Unit.

M. Barton, and G. L. Pearson.  
In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, p 81-82, 1972.

Descriptors: \*Snow surveys, \*Water yield, \*Runoff forecasting, Water supply, Precipitation

gages, Telemetry, Data collections, Data processing.

The Soil Conservation Service is issuing Section 22 entitled 'Snow Survey and Water Supply Forecasting' of the SCS National Engineering Handbook. Section 22 provides detailed information on many aspects of snow surveys and water supply forecasting. It will be useful not only for specialists in this field but also for scholars and students because it is a compilation of information not previously available in a single publication. It is available from U. S. Government Printing Office. Section 22 is divided into nine chapters. Major topics are: Data Collection for Water Supply Forecasting, Telemetry in Data Collection, Travel to Collect Data, Data Processing, Water Supply Forecasting, and Maintenance of Installations and Equipment. Section 22 is the first comprehensive text on snow surveys and water supply forecasting since Dr. J. E. Church introduced modern snow survey techniques at Mt. Rose, Nev., in 1904 to 1910. (See also W73-08138) (Knapp-USGS)  
W73-08153

**SOUTH DAKOTA WEATHER MODIFICATION PROGRAM,**  
South Dakota Weather Control Commission, Pierre.  
For primary bibliographic entry see Field 03B.  
W73-08154

**AVANLANCHE ON SAKHALIN AND THE KURIL ISLANDS (LAVINY SAKHALINA I KURIL'SKIKH OSTROVOV).**

Sakhalinskoye Upravleniye Gidrometeorologicheskoy Sluzhby; Gidrometeoizdat, K. F. Voytovskiy, and V. Ye. Barabash, editors, Leningrad, 1971. 180 p.

Descriptors: \*Avalanches, \*Snow, \*Snow cover, \*Snowfall, \*Islands, Snow surveys, Meteorology, Climatology, Topography, Orography, Mountains, Winds, Storms, Disasters, Safety, Engineering structures, Control structures, Transportation, Communication, Seasonal.

Identifiers: \*USSR, \*Sakhalin Island, \*Kuril Islands, Avalanche hazard, Avalanche control, Snow density, Snow loads.

Evolution and occurrence of avalanches on Sakhalin and the Kuril Islands were investigated for avalanche-hazard evaluation and avalanche prevention and control in this collection of 14 papers prepared on the basis of research conducted by a number of organizations in the USSR. These include the Sakhalin Administration of the Hydrometeorological Service, the Department of Geography of Moscow State University, the Institute 'Sakhalinogradniproekt,' the Novosibirsk Institute of Railroad Transportation Engineers, and the Novosibirsk Scientific Research Institute of Power Engineering. Among the topics discussed are: (1) avalanche activity on Sakhalin Island; (2) avalanche hazard on the Kuril Islands; (3) construction and testing of avalanche-control installations; (4) mass avalanching on Southern Sakhalin in the winter of 1969-70; (5) snow avalanches on sections of railway lines in Southern Sakhalin; (6) determination of snow loads on avalanche-control structures; and (7) distribution of snow in mountainous areas of Sakhalin. (See W73-08166 thru W73-08171) (Josefson-USGS)  
W73-08165

**A GENERAL REVIEW OF AVANLANCHE ACTIVITY ON SAKHALIN ISLAND (OBOSHCHIY OBZOR LAVINNOGO REZHIMA O. SAKHALINA),**  
A. V. Ivanov.

In: Laviny Sakhalina i Kuril'skikh ostrovov. Sakhalinskoye Upravleniye Gidrometeorologicheskoy Sluzhby; Gidrometeoizdat, Leningrad, p 4-23, 1971. 4 fig, 2 tab, 14 ref.

Descriptors: \*Avalanches, \*Snow, \*Snow cover, Snowfall, Storms, Winds, Precipitation (Atmospheric), Air temperature, Rime, Meteorology, Climatology, Topography, Orography, Vegetation, Forests, Earthquakes, Disasters, Mapping.

Identifiers: \*USSR, \*Sakhalin Island, Avalanche hazard, Avalanche classification, Avalanche cones, Snow stability.

Investigations of snow avalanches on Sakhalin Island were based on data collected in 1965-70 by the Sakhalin Administration of the Hydrometeorological Service. The major factors responsible for avalanche formation on the island are topography, climate, and mountain vegetation. About 50% of all avalanches observed had a volume of less than 2,000 cu m, while 15% or fewer had a volume of more than 10,000 cu m. Despite their relatively small size, the avalanches pose a serious threat to railroad and highway construction and have caused much damage to forested areas. A regionalization of the island by degree of avalanche hazard is based on frequency of avalanche occurrence, snow conditions, forest cover, and character of the relief and vegetation. (See also W73-08165) (Josefson-USGS)  
W73-08166

**A DESCRIPTION OF AVANLANCHE HAZARD ON THE KURIL ISLANDS (KHARAKTERISTIKA LAVINNOY OPASNOSTI KURIL'SKIKH OSTROVOV),**  
Moscow State Univ. (USSR). Problemnaya Laboratoriya Nezhynykh Lavin i Selei. N. A. Volodicheva.

In: Laviny Sakhalina i Kuril'skikh ostrovov. Sakhalinskoye Upravleniye Gidrometeorologicheskoy Sluzhby; Gidrometeoizdat, Leningrad, p 26-39, 1971. 4 fig, 15 ref.

Descriptors: \*Islands, \*Avalanches, \*Snow, \*Snow cover, Snowfall, Storms, Winds, Precipitation (Atmospheric), Meteorology, Climatology, Topography, Orography, Vegetation, Volcanoes, Craters, Aerial photography, Maps.

Identifiers: \*USSR, \*Kuril Islands, \*Avalanche hazard, Snowslides, Geobotany.

Preparation of a map of snow avalanche-hazard regions in the Kuril Islands was based on geographical analysis of topography, climate, and vegetation; field surveys of mountainous areas; aerial photographic interpretation; and aircraft observations. The islands are grouped according to avalanche danger into four classes as (1) very high (northern islands of Paramushir, Atlasov, Onekotan, Shishikotan, and other smaller islands southward to Ketoy); (2) slight (Simushir, Urup and the group of small islands between them); (3) potential (Kunashir and Iturup); and (4) none (islands of the Lesser Kuril chain). (See also W73-08165) (Josefson-USGS)  
W73-08167

**MASS AVANLANCHING ON SOUTHERN SAKHALIN IN THE WINTER OF 1969-70 (MASSOVY SKHOD LAVIN NA YUZHNOY SAKHALINE ZIMOY 1969-70 G.),**  
A. V. Ivanov.

In: Laviny Sakhalina i Kuril'skikh ostrovov. Sakhalinskoye Upravleniye Gidrometeorologicheskoy Sluzhby; Gidrometeoizdat, Leningrad, p 74-87, 1971. 5 fig, 3 tab, 3 ref.

Descriptors: \*Avalanches, \*Snow, \*Snowfall, \*Disasters, \*Meteorology, Precipitation intensity, Snow cornice, Cyclones, Air temperature, Winds, Storms, Topography, Slopes, Mountains, Seasonal, Winter.

Identifiers: \*USSR, \*Sakhalin Island, Snow density, Geobotany.

## Field 02—WATER CYCLE

### Group 2C—Snow, Ice, and Frost

Excessive precipitation, strong winds, and prolonged and intense snowfalls were the principal factors responsible for mass movement of avalanches in mountains of Southern Sakhalin in the winter of 1969-70. Precipitation intensity during a 24-hour avalanche period for different parts of Southern Sakhalin varied between 0.6 and 2.8 mm/hr. The rate of increase of snow depth during snowfall averaged 0.5-1.0 cm/hr, reaching maximum values of 4-6 cm/hr in individual 3-hour periods. Dry-power snow avalanches caused considerable damage to the national economy. Road and rail traffic was disrupted between Yuzhno-Sakhalinsk and Kholmsk and between Shebunino and Il'inskiy for long periods of time; forested areas were devastated; and numerous buildings and structures were demolished. Except for isolated cases of avalanching on stretches of highways and railway lines, wet-snow avalanches created no serious problems. On the basis of 1965-70 observation data, reports of local inhabitants, and geobotanical investigations, the greatest volumes and distances of flowage of avalanches in the area in the last 30-50 years occurred in the winter of 1969-70. (See also W73-08165) (Josefson-USGS)  
W73-08168

**SNOW AVALANCHES ON SECTIONS OF RAILWAY LINES IN SOUTHERN SAKHALIN (O SNEZHNYKH LAVINAKH NA UCHASTKAKH ZHELEZNYKH DOROG YUZHNOGO SAKHALINA),**  
Institut Inzhenerov Zhelezodorozhnoy Transporta, Novosibirsk (USSR).  
E. P. Isayenko, and Yu. A. Marin.  
In: Laviny Sakhalina i Kuril'skikh ostrovov. Sakhalinskoye Upravleniye Gidrometeorologicheskoy Sluzhby; Gidrometeoizdat, Leningrad, p 102-108, 1971. 2 fig, 4 tab, 3 ref.

Descriptors: \*Avalanches, \*Snow, \*Snow cover, \*Snowfall, \*Railroads, Slopes, Mountains, Storms, Winds, Forecasting.  
Identifiers: \*USSR, \*Sakhalin Island, Avalanche hazard, Avalanche control, Snowslides.

Snow avalanches on railway lines in mountainous areas of Southern Sakhalin were investigated for avalanche prevention and control. Data are presented on exposure of avalanche-hazard slopes on the rail line between Yuzhno-Sakhalinsk and Kholmsk, and conditions conducive to snow-avalanche formation are examined for avalanche-hazard forecast. (See also W73-08165) (Josefson-USGS)  
W73-08169

**FORMATION AND PHYSICO-MECHANICAL PROPERTIES OF SNOW COVER ON AVALANCHE-HAZARD SLOPES ALONG THE RAILWAY LINE BETWEEN YUZHNO-SAKHALINSK AND KHOLOMSK (OSOBNOSTI FORMIROVANIYA I FIZIKO-MECHANICHESKИYHO SVOYSTVA SNEZHNOGO POKROVVA NA LAVINOOPASNKH SKLONAKH VDOL' ZHELEZNOY DOROGI YUZHNO-SAKHALINSK-KHOLOMSK),**  
Institut Inzhenerov Zhelezodorozhnoy Transporta, Novosibirsk (USSR).  
E. P. Isayenko, Yu. A. Marin, and V. I. Yadroshnikov.

In: Laviny Sakhalina i Kuril'skikh ostrovov. Sakhalinskoye Upravleniye Gidrometeorologicheskoy Sluzhby; Gidrometeoizdat, Leningrad, p 109-123, 1971. 7 fig, 7 tab, 3 ref.

Descriptors: \*Avalanches, \*Snow cover, \*Slopes, \*Railroads, \*Properties, Mechanical properties, Physical properties, Temperature, Thermocline, Meteorology, Cyclones, Winds, Storms, Mountains, Snow surveys, Seasonal.  
Identifiers: \*USSR, \*Sakhalin Island, \*Avalanche hazard, Avalanche control, Snow stability, Snow density, Snow classification.

Snow deposition, stratigraphy, temperature regime, and physico-mechanical properties were investigated on avalanche-hazard slopes along a 25-km line of railroad track between Yuzhno-Sakhalinsk and Kholmsk in the southern half of Sakhalin Island. Investigations were carried out in 1967-70 by the Novosibirsk Institute of Railroad Transportation Engineers for protection of railroads from snow avalanches. The data obtained provide information on the formation and development of snowpacks in the vicinity of the railway line and can be used for planning avalanche control. (See also W73-08165) (Josefson-USGS)  
W73-08170

#### DISTRIBUTION OF SNOW IN MOUNTAINOUS AREAS OF SAKHALIN (RASPREDELENIYE SNEZHNOGO POKROVVA V GORNЫХ RAYONAKH SAKHALINA),

I. F. Monastyrskiy.  
In: Laviny Sakhalina i Kuril'skikh ostrovov. Sakhalinskoye Upravleniye Gidrometeorologicheskoy Sluzhby; Gidrometeoizdat, Leningrad, p 140-144, 1971. 2 fig, 1 tab, 3 ref.

Descriptors: \*Snow, \*Snow cover, \*Mountains, Distribution, Depth, Snowfall, Snowmelt, Water equivalent, Altitude, Snow surveys, Seasonal.  
Identifiers: \*USSR, \*Sakhalin Island, Snow density.

Annual duration of snow cover on plains in the central part of Sakhalin Island is 5-6 months and in the southern part of the island about 5 months. Because of slower melting in spring, snow is retained 1-2 months longer in the mountains than on the plains. Snow depth in the mountains usually reaches maximum values during the second half of March and averages 60-100 cm in the central part and 100-150 cm in the southern part. At lower altitudes (0-300 m), snow disappears completely in the south by the end of April and in the north by the middle of March. In the central part of the island, snow on the east coast lasts 20-30 days longer than snow on the west coast. Provided depth of snow cover is less than 1 m, a linear relation exists between snow depth and density from mid-December to mid-March. On the basis of snow-survey data, snow density in March varies between 0.18 and 0.35 g/cm<sup>3</sup> and in April between 0.23 and 0.40 g/cm<sup>3</sup>. For 1961-70, the vertical gradient of maximum snow-water equivalent was assumed to equal 40 mm/100m for central regions of the island and 70 mm/100m for regions in the south. (See also W73-08165) (Josefson-USGS)  
W73-08171

#### AN ANALYSIS OF YEARLY DIFFERENCES IN SNOWPACK INVENTORY-PREDICTION RELATIONSHIPS,

Arizona Univ., Tucson. Dept. of Watershed Management.

P. F. Ffolliott, D. B. Thorud, and R. W. Enz.  
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1972 meetings of the Arizona Section—American Water Resources Assn. and the Hydrology Section—Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, Vol 2, (1972), p 31-42. 3 fig, 2 tab, 7 ref. OWRR A-014-ARIZ (8). 14-31-0001-3203.

Descriptors: \*Runoff forecasting, \*Snowpacks, \*Spatial distribution, \*Forest management, \*Vegetation effects, Forecasting, Census, Forests, Watershed management, Snow surveys, Water equivalent, Water yield, Snow management, Canopy, \*Arizona.  
Identifiers: \*Inventory-prediction, Ponderosa pine.

Inventory-prediction relationships between snowpack conditions and forest attributes may be useful in estimating water yields derived from snow, water but such relationships are developed usually from source data collected over a short time period. Analyses of long-term data suggest inventory-prediction relationships developed from limited data may have more general application, however. Available records from 18 snow courses in the ponderosa pine type in Arizona provided source data in this study, which was designed to empirically analyze inventory-prediction relationships developed from long-term Snow Survey records. The primary hypothesis tested and evaluated by statistically analyzing the family of regression equations representing a snow course, was that, given a precipitation input, the distribution of snowpack water equivalent at peak seasonal accumulation is determined by the spatial arrangement of the forest cover, e.g. basal area. Generally 12 of the 18 snow courses evaluated appeared to support the hypothesis, three courses did not, and three courses were considered inconclusive. (White-Arizona)  
W73-08301

#### REVERSING BARCHAN DUNES IN LOWER VICTORIA VALLEY, ANTARCTICA,

Lunar Science Inst., Houston, Tex.  
For primary bibliographic entry see Field 02J.  
W73-08373

#### VENTIFACT EVOLUTION IN WRIGHT VALLEY, ANTARCTICA,

Lunar Science Inst., Houston, Tex.  
For primary bibliographic entry see Field 02J.  
W73-08374

#### PLANT SUCCESSION ON TUNDRA MUD-FLOWS: PRELIMINARY OBSERVATIONS,

Carleton Univ., Ottawa (Ontario). Dept. of Biology.  
For primary bibliographic entry see Field 02G.  
W73-08409

## 2D. Evaporation and Transpiration

#### COMPARATIVE STUDIES ON THE TRANSPIRATION IN PEDUNCULATE OAK-HORNBEAM COSE AND ON AGRICULTURAL FIELDS IN PETROVINA (TUROPOLJE NEAR ZAGREB), (IN SERBO-CROATIAN),

M. Gracanin, L. Ilijanic, V. Gazi, and N. Huilina. Acta Bot Croat. 30 p 57-84, 1971. Illus.  
Identifiers: Agriculture, Copse, Erigeron canadensis D, Hornbeam D, Light, Moisture, \*Oak D, Opening, Pedunculate, \*Petrovina (Yugoslavia), Soils, Stomate, Temperature, \*Transpiration, Wheat M.

Studies were made in humid, moderately warm area (yearly precipitation 930 mm, average temperature 10 degrees C) with moderately podzolized loam-clay soils. Studies were made on various tree species, 3 varieties of wheat and species of weeds. Measurements of transpiration were made from April 29 to Sept. 4, 1969 every 2 hr daily from 8 a.m. to 6 p.m. Relative humidity, temperature of the air and soil, light intensity and soil dampness were also measured. The condition of the stomates (size of opening) were also measured with the infiltration method (alcohol and xylene). The tree species were found to have a significantly lower transpiration rate than the wheat or weed species. The daily sum of transpiration was from 2.59 to 7.22 g/g fresh weight for the forest species and 9.65 to 11.73 g/g for the wheat varieties. The weed species showed high transpiration capacity. Erigeron canadensis had a maximum daily sum of transpiration of 19.68 g/g. Wheat and weed species appear to affect the soil water balance much more than the forest species. The agricultural soil was much drier than the forest soil. External conditions (light intensity, temperature, relative humidity) can effect transpiration intensity. The greater

## WATER CYCLE—Field 02

### Streamflow and Runoff—Group 2E

heating of the leaves on agricultural areas and the subsequent increased vapor pressure in intercellular areas can significantly increase transpiration. The size of the stomate opening was much larger in wheat than in the trees.—Copyright 1972, Biological Abstracts, Inc.  
W73-08057

#### THE REGRESSION OF NET RADIATION UPON SOLAR RADIATION, Oregon State Univ., Corvallis. Water Resources Research Inst. L. W. Gay.

Arch. Met. Geoph. Biokl., Ser. B, 19, p 1-14, 1971, also published as Paper 710, Forest Research Lab., Oregon State University. 3 fig, 14 p. OWRR A-001-ORE (10).

Descriptors: \*Regression analysis, \*Radiation, Net radiation, Solar radiation, Evapotranspiration, Statistical model, Model studies.

A number of studies have sought to relate net radiation over natural surfaces to incoming global radiation. Several deficiencies are noted in interpretation of the simple regression models used for this purpose in the past. A modification proposed for correction of these deficiencies introduces a new longwave exchange coefficient, lambda, that relates the change in net longwave radiation to the change in net shortwave radiation. This coefficient is a conceptual improvement of beta, the surface heating coefficient that has gained some acceptance. The definition of a unique lambda for various surfaces is shown to be the same problem faced by past studies that have sought to develop a unique regression equation over each surface. The coefficient lambda may serve as an index of the surface properties that govern the dissipation of absorbed global radiation. This index is also affected by environmental characteristics. Interpretation of the index is demonstrated for three types of surfaces under cloudless skies: a desert, a forest, and an irrigated crop. Further consideration of the coefficient, lambda reveals that the apparent success of regression relations linking net and global radiation may often be attributed to negligible variation of longwave exchange, rather than to the soundness of a particular regression model.  
W73-08175

#### OBSERVATIONS ON THE TRANSPERSION OF TWO SPECIES OF AMARANTHUS, (IN PORTUGUESE), Sao Paulo Univ. (Brazil). Escola Superior de Agricultura Luiz de Queiroz. H. Reyes-Zumeta, and P. N. Camargo. Cien. Cult. Vol 23, No 3, P 351-361. 1971, Illus. (English summary). Identifiers: \*Amaranthus, Amaranthus hybridus D, Amaranthus viridis D, Brazil, Coffee D, Plantation, Species, \*Transpiration.

Observations were made on the variation of transpiration in Amaranthus hybridus and A. viridis in Piracicaba, Brazil, during the rainy season. There was no apparent restriction in the total transpiration during the day. The relative transpiration ( $T/E_0$ ) showed that A. hybridus had no restriction, while A. viridis showed a strong restriction between 10:25 a.m. and 12:05 p.m. This behavior may be due to the habitats of the plants, A. viridis grew inside the coffee plantation, and A. hybridus grew 3 m from the crop border. The different transpirational behavior of the 2 spp. may be attributed to the stronger competition for water by the coffee plants with A. viridis than with A. hybridus.—Copyright 1972, Biological Abstracts, Inc.  
W73-08240

IDENTIFICATION OF A DAY OF MOISTURE STRESS IN MAIZE AT CEDARA,  
Agricultural Research Inst., Cedara (South Africa).  
J. B. Mallett, and J. M. DeJager.  
Agron. Plantae, Vol 3, No 3, p 45-50, 1971. Illus.  
Identifiers: \*Cedara (So. Africa), \*Evaporation, \*Maize, \*Moisture stress, Soils, Transpiration.  
W73-08337

As atmospheric evaporative demand increases towards 10 mm per day the available soil moisture required to prevent stress from occurring steadily increases up to 75%. Above 75% plant available moisture, wilting is seldom induced. Evaporative demand was measured using a USA Weather Bureau Class A evaporation pan, while soil moisture and evapotranspiration were determined by means of mass-measuring lysimeters.—Copyright 1972, Biological Abstracts, Inc.  
W73-08337

THE BIONIC RELATIONSHIP BETWEEN TRANSPERSION IN VASCULAR PLANTS AND THE HEAT PIPE,  
Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.  
J. F. Osterle, and J. G. McGowan.  
Math Biosci, Vol 14, No 3/4, p 317-323, 1972, Illus.  
Identifiers: \*Bionics, \*Heat pipe, Plants, Relationship, \*Transpiration, \*Vascular plants, Model studies.

The relationship between the transpiration system in vascular plants and the heat pipe was viewed from the standpoint of bionics—the science of systems whose function is based on living systems. The 2 systems were identical as revealed by a mathematical model based on equilibrium and nonequilibrium thermodynamics. Both energy conversion devices were found to be thermal pumps operating in a special mode.—Copyright 1972, Biological Abstracts, Inc.  
W73-08348

EFFECTS OF ABSCISIC ACID AND ITS ESTERS ON STOMATAL APERTURE AND THE TRANSPERSION RATIO,  
King's Coll., London (England). Dept of Botany.  
For primary bibliographic entry see Field 021.  
W73-08420

## 2E. Streamflow and Runoff

AN INEXPENSIVE, RECORDING TIDE GAUGE,  
Brookhaven National Lab., Upton, N.Y. Dept. of Biology.  
For primary bibliographic entry see Field 07B.  
W73-07852

HYDROGRAPH ANALYSIS AND SOME RELATED GEOMORPHIC VARIABLES,  
Nebraska Univ., Omaha. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 02J.  
W73-07878

PREDICTING TIME-OF-TRAVEL IN STREAM SYSTEMS,  
Illinois State Water Survey, Urbana.  
For primary bibliographic entry see Field 02J.  
W73-07879

HYDROGEOMORPHOLOGY OF SUSQUEHANNA AND DELAWARE BASINS,  
State Univ. of New York, Binghamton. Dept. of Geology.  
For primary bibliographic entry see Field 02J.  
W73-07880

EUREKA—IT FITS A PEARSON TYPE 3 DISTRIBUTION,  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 04A.  
W73-07883

APPLICATION OF NONLINEAR SYSTEM IDENTIFICATION TO THE LOWER MEKONG RIVER, SOUTHEAST ASIA,  
Geological Survey, Menlo Park, Calif. Water Resources Div.  
For primary bibliographic entry see Field 04A.  
W73-07884

INTRODUCTION OF TIME VARIANCE TO CONCEPTUAL CATCHMENT MODELS,  
Institute of Hydrology, Wallingford (England).  
For primary bibliographic entry see Field 02A.  
W73-07885

DETERMINATION OF OPTIMAL KERNELS FOR SECOND-ORDER STATIONARY SURFACE RUNOFF SYSTEMS,  
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 02A.  
W73-07886

IDENTIFICATION OF MULTIPLE REACH CHANNEL PARAMETERS,  
California Univ., Los Angeles. Dept. of Engineering Systems.  
L. Becker, and W. W-G. Yeh.  
Water Resources Research, Vol 9, No 2, p 326-335, April 1973. 3 fig, 3 tab, 8 ref, 2 append.

Descriptors: \*Mathematical models, \*Open channel flow, \*Numerical analysis, \*Routing, Finite element analysis, Computer programs, Streamflow forecasting, Hydrograph analysis.

The influence coefficient algorithm for the solution of the parameter identification problem is extended to multiple-reach channel flows. The stage hydrograph, velocity data, and observation station location requirements for an effective determination of the parameters are discussed. Application involves identification of the individual reach friction parameters, which are not physically measurable and which have to be determined from the mathematical model by the use of concurrent input and output measurements. The influence coefficient algorithm is incorporated with numerical solutions of the unsteady equations of flow through explicit finite difference formulations of these equations. The explicit formulations simplify the computer program but necessitate special precautions to avoid computational instabilities. The stability criteria which must be observed are indicated. (Knapp-USGS)  
W73-07887

STORM FLOW FROM HARDWOOD-FORESTED AND CLEARED WATERSHEDS IN NEW HAMPSHIRE,  
Forest Service (USDA), Durham, N.H. Northeastern Forest Experiment Station.  
For primary bibliographic entry see Field 04C.  
W73-07889

MEASURE OF THREE-DIMENSIONAL DRAINAGE BASIN FORM,  
Cambridge Univ. (England). Dept. of Geography.  
For primary bibliographic entry see Field 02A.  
W73-07892

SPRING DISCHARGE OF AN ARCTIC RIVER DETERMINED FROM SALINITY MEASUREMENTS BENEATH SEA ICE,  
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

## Field 02—WATER CYCLE

### Group 2E—Streamflow and Runoff

For primary bibliographic entry see Field 02C.  
W73-07900

**BOTTOM CURRENTS IN THE HUDSON CANYON,**  
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.  
G. H. Keller, D. Lambert, G. Rowe, and N. Staresinic.  
Science, Vol 180, No 4082, p 181-183, April 13, 1973. 3 fig, 14 ref.

Descriptors: \*Sediment transport, \*Submarine canyons, \*Hudson River, \*Currents (Water), Streamflow, Tides, Stream gages, Current meters, Data collections, Flow measurement, Path of pollutants.

Identifiers: \*Hudson submarine canyon.

In the Hudson Canyon the current regime is characterized by a pronounced reversal of flow up and down the canyon. Velocities are common of the order of 8 to 15 cm/sec, reaching 27 cm/sec on occasion in the upper and central portion of the canyon. Although a 2.5-day recording of currents showed a net transport up canyon, a combination of 66 current measurements from the submersible Alvin, analysis of sediment texture and organic carbon, and determination of the benthic faunal nutrient relationship indicate that over the long term there is a net transport of fine material through the canyon to the outer continental rise. (Knapp-USGS)

W73-07903

**STUDIES ON THE FLUVIAL ENVIRONMENT, ARCTIC COASTAL PLAIN PROVINCE, NORTHERN ALASKA, VOLUMES I AND II,**  
For primary bibliographic entry see Field 02C.

W73-07906

**REGULATION OF STREAMFLOW (REGULIROVANIYE RECHNOGO STOKA),**  
For primary bibliographic entry see Field 04A.

W73-07909

**ROTARY CURRENTS, ACCORDING TO MEASUREMENTS IN THE OCEAN,**  
Akademiya Nauk SSSR, Gelendzhik. Institut Okeanologii.  
V. B. Titov.  
Oceanology, Vol 12, No 2, p 177-181, 1972. 2 fig, 1 tab, 1 ref. Translated from Okeanologiya (USSR), Vol 12, No 2, 1972.

Descriptors: \*Oceanography, \*Currents (Water), \*Rotational flow, \*Ocean currents, Rotations, Measurement, Instrumentation, Buoys, Depth, Velocity.

Identifiers: \*USSR, \*Rotary currents.

Five instances of unusual, clearly defined, periodic, cyclonic rotary ocean currents with an average period of about 1.5 hours have been observed in recent years on expeditions conducted by the Institute of Oceanography, USSR Academy of Sciences. A possible cause of formation of these rotary currents is the local transverse irregularity of the flow velocity field, which generates vortices with vertical axes of rotation. (Josefson-USGS)

W73-07915

**INSTANTANEOUS UNIT HYDROGRAPHS, PEAK DISCHARGES AND TIME LAGS IN URBANIZING WATERSHEDS,**  
Purdue Univ., Lafayette, Ind. School of Civil Engineering.

For primary bibliographic entry see Field 02A.

W73-07917

**TRANSPOSITION OF STORMS FOR ESTIMATING FLOOD PROBABILITY DISTRIBUTIONS,**  
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.  
V. K. Gupta.

Colorado State University Hydrology Papers, No 59, November 1972. 35 p, 30 fig, 7 tab, 18 ref, 1 append. NSF Grant No. 11444.

Descriptors: \*Storms, \*Floods, \*Flood forecasting, \*Flood frequency, Methodology, Theoretical analysis, River basins, Stochastic processes, Hydrologic data, Historic floods, Flood data, Model studies, Rainfall-runoff relationships, Regional flood, Geomorphology, Streamflow, Flow characteristics.

Contemporary literature in hydrology usually contains the concepts of maximum probable precipitation and maximum probable flood along with methods used to arrive at these limits. These limits signify some physical upper limits for precipitation and flood; however, it is difficult to find physical justification for existence of these limits and more so the methods used to compute them. Also, the use of the word 'probable' is incorrect because these 'probable limits' are not assigned any probabilities. In view of the misconceptions, practical methodology is described with a theoretical framework for estimating the probability of occurrence of floods in a unit time interval, based on the random characteristics of storms. In general, many random characteristics can be defined for a storm, but as a first step only a three-dimensional random vector has been defined for the random characteristics of storms. The random vector is comprised of the coordinates of storm center location and storm orientation. The developed estimation methodology uses all information on historic storms observed in a region that contains the river basin. (Woodard-USGS)

W73-08085

**INFLUENCE OF LATE SEASON PRECIPITATION ON RUNOFF OF THE KINGS RIVER,**  
Sierra Hydrotechnology, Placerville, Calif.  
For primary bibliographic entry see Field 02A.

W73-08151

**DRAINAGE AREAS, HARTFORD NORTH QUADRANGLE, CONNECTICUT,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.

W73-08173

**EFFECTIVE HYDRAULIC ROUGHNESS FOR CHANNELS HAVING BED ROUGHNESS DIFFERENT FROM BANK ROUGHNESS,**  
Army Engineer Waterways Experiment Station, Vicksburg, Miss.  
For primary bibliographic entry see Field 08B.

W73-08350

**A PLAN FOR STUDY OF WATER RESOURCES IN THE PLATTE RIVER BASIN, NEBRASKA—WITH SPECIAL EMPHASIS ON THE STREAM-AQUIFER RELATIONS,**  
Geological Survey, Lincoln, Nebr. Water Resources Div.  
For primary bibliographic entry see Field 02A.

W73-08357

**APPLICATIONS OF REMOTE SENSING TO STREAM DISCHARGE PREDICTION,**  
National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center.

For primary bibliographic entry see Field 07B.

W73-08359

**TIME-OF-TRAVEL STUDY, BATTEN KILL FROM 0.6 MILE EAST OF VERMONT-NEW YORK BORDER TO CLARKS MILLS, NEW YORK,**  
Geological Survey, Albany, N.Y.

For primary bibliographic entry see Field 05B.  
W73-08368

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-1970: PART 6-MISSOURI RIVER BASIN, VOLUME 4-MISSOURI RIVER BASIN BELOW NEBRASKA CITY, NEBRASKA.**  
Geological Survey, Washington, D.C. Water Resources Div.

For primary bibliographic entry see Field 07C.  
W73-08381

## 2F. Groundwater

**THE USE OF LANDSCAPE-INDICATOR METHODS IN HYDROGEOLOGICAL INVESTIGATIONS,**  
Moskovskoe Obschestvo Ispytatelei Prirody (USSR), Geographic Div.

I. K. Abrosimov, and Yu. M. Kleiner.

In: *Landscape Indicators—New Techniques in Geology and Geography*: Consultants Bureau, Div of Plenum Press, London and New York, p 34-38, 1973. 15 fig. (Translated from Russian. Proceedings of Conference of Moscow Society of Naturalists, May 21-22, 1968. Moscow, Nauka Press).

Descriptors: \*Mapping, \*Hydrogeology, \*Geomorphology, \*Terrain analysis, \*Vegetation effects, Aerial photography, Remote sensing, Faults (Geologic), Fractures (Geologic), Karst, Karst hydrology, Springs, Investigations, Data collections, Groundwater, Topography.

Identifiers: \*USSR.

The landscape-indicator method of prospecting for and mapping shallow groundwater is becoming widely used in water-indicator investigations in the USSR. Vegetation is used as a direct indicator of depth and mineralization of shallow water. Relief and lithology of surface rocks are indirect indicators of water. Thus, in arid regions, slightly indurated eolian deposits are the sites of lenses of fresh water, and these may be revealed by plant indicators in zones where such lenses discharge. Karst-forming processes are rather clearly indicated by vegetation. Sinks and canyon-like karst valleys, in addition to physiognomic expression in the landscape, are also marked by specific plant communities. Lineaments (straight segments of stream valleys, scarps, rectilinear shores, etc.), are most commonly geomorphic expressions of deep fractures, very well reflected in the landscape because of the discharge of groundwater along these fractures. (Knapp-USGS)

W73-07843

**STUDY OF THE HYDROGEOLOGICAL CONDITIONS OF ALLUVIAL FANS BY MULTIPLE LANDSCAPE AND GEOPHYSICAL METHODS,**  
Moskovskoe Obschestvo Ispytatelei Prirody (USSR), Geographic Div.

N. N. Sharapov, and A. V. Shavryina.

In: *Landscape Indicators—New Techniques in Geology and Geography*: Consultants Bureau, Div of Plenum Press, London and New York, p 39-47, 1973. 2 fig, 3 tab, 2 ref. (Translated from Russian. Proceedings of Conference of Moscow Society of Naturalists, May 21-22, 1968, Moscow, Nauka Press).

Descriptors: \*Alluvial fans, \*Terrain analysis, \*Geophysics, \*Electrical studies, \*Hydrogeology, Surveys, Investigations, Data collections, Alluvium, Geomorphology, Alluvial channels, Groundwater, Topography.

Identifiers: \*USSR.

A new method of studying alluvial fans on the piedmont plains of Central Asia, USSR, uses a combination of geophysical and landscape methods to replace a great amount of drilling. Geophysical methods include direct-current electrical surveying and induced potentials. The proposed combination of methods of investigation may solve the following geological-hydrogeological problems: (1) the grouping of alluvial fans by types according to morphology, source of material, and possible degree of flooding; (2) determination of thickness and lithology of the unconsolidated deposits in fans of each type; (3) study of the hydrogeological conditions of these deposits (determination of water table, discrimination of zones of different mineralization, qualitative evaluation of reservoir properties of aquifers). On the basis of the data obtained, a hydrogeological map of the alluvial fans may be prepared. (Knapp-USGS)  
W73-07844

**LANDSCAPE-INDICATOR INVESTIGATIONS OF KARST.**  
Moskovskoe Obshchestvo Ispytatelei Prirody (USSR). Geographic Div.

A. G. Chikishev.

In: *Landscape Indicators—New Techniques in Geology and Geography*; Consultants Bureau, Div of Plenum Press, London and New York, p 48-63, 1973. 5 fig, 54 ref. (Translated from Russian. Proceedings of Conference of Moscow Society of Naturalists, May 21-22, 1968, Moscow, Nauka Press).

Descriptors: \*Terrain analysis, \*Karst, \*Hydrogeology, \*Geomorphology, Karst hydrology, Mapping, Aerial photography, Remote sensing, Vegetation effects, Data collections, Groundwater, Topography.

Identifiers: \*USSR.

In multiple investigations of karst by landscape indicators, aerial photography and direct aerial observation are of fundamental importance. The use of air photos and preliminary aerial flights over the region make it possible to obtain the most complete information concerning the extent of karst development in the region, the morphological aspects of karst forms, and the hydrological conditions of karst formations without laborious surface work. In mountainous regions karst in limestones that crop out at the surface is reliably recognized by a characteristic variegated-porous picture of the photo image and pitted microrelief, emphasized by the darker tone of vegetation associated with the low damper segments. Along with relief and hydrography, vegetation reacts sensitively to the physical and chemical properties of the rocks. The depth to which plants may indicate bedrock covered by unconsolidated deposits varies for different natural zones. The lithology may be indicated by plants in tundra regions to a depth of 1-2 m, in forest zones to a depth of 10 m, and in deserts to a depth of 20 m. (In relation to the principal types of karst formation, plants are divided into calciphiles (confined to carbonate rocks), gypsums (on gypsum rocks), and halophytes (on halite rocks). The contacts between carbonate rocks and other rocks varieties may be drawn with great reliability. Stands of trees on carbonate rocks, because of the extreme dryness of the underlying rock and the harmful effect of calcium in excess, are normally thinner than in neighboring districts underlain by other rocks. (Knapp-USGS)  
W73-07845

**INTERFACE REFRACTION AT THE BOUNDARY BETWEEN TWO POROUS MEDIA.**  
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 02L.  
W73-07896

**STEADY SEEPAGE FLOW TO SINK PAIRS SYMMETRICALLY SITUATED ABOVE AND BELOW A HORIZONTAL DIFFUSING INTERFACE: 1. PARALLEL LINE SINKS.**  
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Engineering.  
E. J. Wolanski, and R. A. Wooding.  
Water Resources Research, Vol 9, No 2, p 415-423, April 1973. 7 fig, 16 ref.

Descriptors: \*Saline water-freshwater interfaces, \*Diffusion, \*Groundwater movement, \*Saline water intrusion, Dispersion, Encroachment, Withdrawal, Steady flow, Saturated flow, Safe yield, Boundary layers.

The flow regime close to a pair of wells situated on opposite sides of a diffusing interface between freshwater overlying saline water is illustrated using an idealized symmetrical system. The interface is horizontal, and gravitational effects are neglected. A uniform flow is parallel to the interface, and the fresh and saline fluids are separated by a thin impermeable layer at a finite distance upstream from the sinks. The edge of the impermeable layer provides a definite starting point for diffusive mixing at the interface. As part of a large-scale gravity system, flow in the upper fluid should bear a qualitative resemblance to real situations where freshwater is moving slowly over nearly stationary saltwater. Boundary layer theory is used to treat the growth of the diffusive mixing layer, modified by the presence of the sinks. The flux of salt to the upper sink is calculated as a function of the spacing and strength of the uniform flow. A periodic system of sink pairs without an applied flow is also considered. Exact solutions of the boundary layer equations are readily obtained for the two-dimensional case. (Knapp-USGS)  
W73-07897

**UNSTEADY FLOW TO A PARTIALLY PENETRATING, FINITE RADIUS WELL IN AN UNCONFINED AQUIFER,**  
Washington Univ., Seattle.  
K. L. Kipp, Jr.  
Water Resources Research, Vol 9, No 2, p 448-462, April 1973. 8 fig, 18 ref.

Descriptors: \*Unsteady flow, \*Groundwater movement, \*Equations, \*Water yield, \*Drawdown, Saturated flow, Mathematical studies, Numerical analysis, Water wells, Hydraulic conductivity, Aquifer testing, Hydrogeology.  
Identifiers: \*Partially penetrating wells.

Unsteady flow to a single, partially penetrating well of finite radius in an unconfined aquifer is solved theoretically. The aquifer is homogeneous, isotropic, and infinite both in thickness and lateral extent. Perturbation expansion techniques linearize the free surface boundary conditions, so that the solution satisfies the boundary conditions through first order provided that the drawdowns remain small, and that a time limit is imposed. The basic potential field is created by distributing dipole moments over the surface of the well bore and solving the resulting integral equation numerically. The solution can be used to model pumped well behavior for the initial period after the start of pumping. This solution is not restricted to the constant flow rate or constant head modes of simulation. The assumption of constant discharge operation in earlier, more approximate solutions to this problem is more realistic than the assumption of constant head operation. (Knapp-USGS)  
W73-07898

**THE TRANSIENT FLOW PROBLEM - A ONE-DIMENSIONAL DIGITAL MODEL,**  
Wyoming Univ., Laramie. Dept. of Civil and Architectural Engineering.  
R. Hermann.  
MSc thesis, January, 1972. 58 p, 16 fig, 41 ref, 2 append. OWRR-A-001-WYO (53).

Descriptors: \*Groundwater basins, \*Groundwater movement, \*Numerical analysis, \*Simulation analysis, Digital computers, \*Flow, Equations, Water table, Porous media, Rivers, Drains, Wells, Saturated flow, Unsaturated flow, Continuity equation, Management, Dupuit-Forchheimer theory, Darcy's law, Laplace's equation, Steady flow, Unsteady flow, Surface waters, Mathematical models, Systems analysis.  
Identifiers: Finite difference techniques, Bousinesq equation, Glover equation.

Analysis of groundwater basins can be improved by utilizing numerical techniques and digital models to simulate underground flow situations. A solution of the combined flow problem is developed from existing theories of groundwater motion. The flow equations are developed for saturated flow below and unsaturated flow above the water table; a review of the development of these equations leads to a one dimensional equation set which solves a two dimensional flow problem by an implicit iterative procedure. A digital model is developed that solves the boundary value problem for time dependent flow through porous media with a free water table. The model is postulated so that extensive knowledge of flow theory and the physics of flow in porous media are not necessary for understanding the model equation development. The method of solution is based on a finite difference approximation of theoretical time dependent flow equations. The practical applications are for flow to a river, drain, or well. The assumptions necessary to the development of the practical solution of a field or hypothetical flow problem are discussed and justified. (Bell-Cornell)  
W73-07916

**EVENT-RELATED HYDROLOGY AND RADIONUCLIDE TRANSPORT AT THE CAN-NIKIN SITE, AMCHITKA ISLAND, ALASKA,**  
Nevada Univ., Reno. Desert Research Inst.  
For primary bibliographic entry see Field 05B.  
W73-07961

**HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE ARKANSAS RIVER VALLEY, BENT COUNTY, COLORADO,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08068

**HYDRAULIC TESTS IN HOLE UAE-3, AMCHITKA ISLAND, ALASKA,**  
Geological Survey, Lakewood, Colo.  
For primary bibliographic entry see Field 04B.  
W73-08071

**GEOHYDROLOGY AND ARTIFICIAL-RECHARGE POTENTIAL OF THE IRVINE AREA, ORANGE COUNTY, CALIFORNIA,**  
Geological Survey, Menlo Park, Calif. Water Resources Div.  
For primary bibliographic entry see Field 04B.  
W73-08072

**HYDROGEOLOGY AND ENGINEERING GEOLOGY (GIDROGEOLOGIYA I INZHENER-NAYA GEOLOGIYA).**  
Gornyi Institut, Leningrad (USSR).

Zapiski Leningradskogo Gornogo Instituta im. G. V. Plekhanova, Vol 62, No 2, Leningrad, Tolstikhin, N. I., and Kiryukhin, V. A., editors, 1971. 136 p.

Descriptors: \*Hydrogeology, \*Engineering geology, \*Investigations, Groundwater, Groundwater movement, Aquifers, Reservoirs, Intakes, Permafrost, Properties, Rocks, Clays, Salts, Mineralogy, Mining, Quarries, Water types, Water

## Field 02—WATER CYCLE

### Group 2F—Groundwater

pollution, Analytical techniques, Maps, Dispersion.  
Identifiers: \*USSR, Mineral deposits, Icings.

A wide range of hydrogeological and geologic-engineering problems is examined in this collection of 19 papers published by the Leningrad Mining Institute. The topics discussed include groundwater classification and distribution; groundwater in regions of perennially frozen ground; subsurface flow in southern regions of the Soviet Far East; dispersion halos in suprapermafrost waters; salt migration in humid regions; chemical and physico-mechanical properties of clay rocks; and icings in river basins of East Siberia. Techniques are presented for compiling geologic-engineering maps, and investigations are made of mine-water pollution in quarries and of changes in geologic-engineering conditions of mineral deposits after open-pit mining. (Josefson-USGS)  
W73-08163

**A PLAN FOR STUDY OF WATER RESOURCES IN THE PLATTE RIVER BASIN, NEBRASKA—WITH SPECIAL EMPHASIS ON THE STREAM-AQUIFER RELATIONS,**  
Geological Survey, Lincoln, Nebr. Water Resources Div.  
For primary bibliographic entry see Field 02A.  
W73-08357

**HYDROLOGICAL EFFECTS OF THE CANNIKIN EVENT,**  
Geological Survey, Denver, Colo.  
For primary bibliographic entry see Field 04B.  
W73-08367

**MAP SHOWING APPROXIMATE GROUNDWATER CONDITIONS IN THE PARKER QUADRANGLE, ARAHOOE AND DOUGLAS COUNTIES, COLORADO,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08369

**AVAILABILITY OF GROUNDWATER, HARTFORD NORTH QUADRANGLE, CONNECTICUT,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08370

**FUMAROLE WITH PERIODIC WATER FOUNTAINING, VOLCAN ALCEDO, GALAPAGOS ISLANDS,**  
Arizona Univ., Tucson. Dept. of Geosciences.  
For primary bibliographic entry see Field 02K.  
W73-08377

**NATURAL AND ARTIFICIAL GROUNDWATER RECHARGE, WET WALNUT CREEK, CENTRAL KANSAS,**  
Geological Survey, Lawrence, Kans.  
For primary bibliographic entry see Field 04B.  
W73-08379

### 2G. Water in Soils

**SPLASH EROSION RELATED TO SOIL ERODIBILITY INDEXES AND OTHER FOREST SOIL PROPERTIES IN HAWAII,**  
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.  
For primary bibliographic entry see Field 02I.  
W73-07888

**SEEPAGE STEPS IN THE NEW FOREST, HAMPSHIRE, ENGLAND,**  
For primary bibliographic entry see Field 02J.

W73-07891

**MODELING INFILTRATION DURING A STEADY RAIN,**  
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.

R. G. Mein, and C. L. Larson.  
Water Resources Research, Vol 9, No 2, p 384-394, April 1973. 10 fig, 2 tab, 23 ref.

Descriptors: \*Infiltration, \*Rainfall-runoff relationships, \*Mathematical models, Wetting, Soil water movement, Rainfall intensity, Hydraulic conductivity.

A simple two-stage model describes infiltration under a constant intensity rainfall into a homogeneous soil with uniform initial moisture content. The first stage predicts the volume of infiltration to the moment at which surface ponding begins. The second stage, which is the Green-Ampt model modified for the infiltration prior to surface saturation, describes the subsequent infiltration behavior. A method is given for estimating the mean suction of the wetting front. Comparison of the model predictions with experimental data and numerical solutions of the Richards equation for several soil types shows excellent agreement. (Knapp-USGS)  
W73-07893

**HEAT AND MASS TRANSFER OF FREEZING WATER-SOIL SYSTEM,**  
British Columbia Univ., Vancouver. Dept. of Chemical Engineering.  
For primary bibliographic entry see Field 02C.  
W73-07894

**APPROXIMATE SOLUTIONS FOR NON-STEADY COLUMN DRAINAGE,**  
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.  
A. Arbabhira, and Z. U. Ahmed.  
Water Resources Research, Vol 9, No 2, p 401-408, April 1973. 5 fig, 11 ref.

Descriptors: \*Infiltration, \*Percolation, \*Drainage, \*Soil water movement, Unsaturated flow, Capillary action, Equations, Porous media, Porosity, Permeameters.

Approximate solutions for nonsteady column drainage are obtained by application of pore size distribution in a capillary analogy. The analysis is based on the assumption that the drainable pore space of porous media can be represented by a set of capillary tubes of various sizes having a size distribution that provides the same capillary pressure-saturation relationship as the real media. The solutions obtained approximately describe the cumulative outflow and the saturated front as functions of time and measurable soil parameters. Theoretical solutions are verified by using experimental and numerical results. (Knapp-USGS)  
W73-07895

**A TECHNIQUE USING POROUS CUPS FOR WATER SAMPLING AT ANY DEPTH IN THE UNSATURATED ZONE,**  
Geological Survey, Lubbock, Tex.

W. W. Wood.  
Water Resources Research, Vol 9, No 2, p 486-488, April 1973. 2 fig, 2 ref.

Descriptors: \*Sampling, \*Soil water, \*Soil moisture, \*Lysimeters, \*Zone of aeration, Instrumentation, Unsaturated flow.  
Identifiers: \*Suction lysimeters, \*Soil water sampling, Porous cup lysimeters.

Porous cups or suction lysimeters provide a simple and direct method for collecting water samples in the unsaturated zone. A new procedure is described in which a check valve is placed in the

sample collection assembly. This construction permits complete collection at any depth without the loss of samples. A detailed description of construction and operation illustrates the advancement over previous designs. (Knapp-USGS)  
W73-07901

**MOVEMENT OF CHEMICALS IN SOILS BY WATER,**  
Illinois Univ., Urbana. Dept. of Agronomy.

L. T. Kurtz, and S. W. Meisted.  
Soil Science, Vol 115, No 3, p 231-239, March 1973. 3 tab, 42 ref.

Descriptors: \*Water chemistry, \*Leaching, \*Weathering, \*Soil water movement, Ion transport, Translocation, Reviews, Porous media, Tracers, Tracking techniques, Diffusion, Adsorption, Ion exchange.

The movement of water through soils and the transport of chemicals in soil are reviewed. Sometimes the path of water permits deductions about the direction and extent that solutes have been leached and weathering products have been transported. Conversely the best way to trace the movement of soil water is often to dissolve something in it that can be easily traced. Dyes that can be detected visually or by fluorescence, radioactive ions or compounds, stable isotopes, and various salts and ions have been used as tracers. A major problem is that the solvent and solute rarely move at the same rate. Equations have been derived to describe leaching through soils. Although these have not been applied very extensively to weathering, horizon formation, and the other processes of soil development, curves showing the concentration of clay down through different profiles often resemble curves showing the concentration of a salt being leached down through different profiles. In the temperate zone, water is the primary agent of weathering and the agent of transport of the weathering products. The composition of drainage waters can give at least a partial indication of the composition of the soil and the soil moisture. Likewise the composition of stream waters at low flow partially reflects the composition of water and the degree of weathering in the soils of the region. (Knapp-USGS)  
W73-07904

**MODELING THE MOVEMENT OF CHEMICALS IN SOILS BY WATER,**  
Illinois Univ., Urbana. Dept. of Agronomy.

C. W. Boat.  
Soil Science, Vol 115, No 3, p 224-230, March 1973. 2 tab, 31 ref.

Descriptors: \*Leaching, \*Ion transport, \*Soil water movement, Model studies, Reviews, Porous media, Dispersion, Diffusion, Adsorption, Ion exchange, Translocation.

The movement of chemicals through soil may be described by applying modeling techniques to the soil-water system. Some of the macroscopic continuum theories are reviewed and are presented in table form. The emphasis of most studies of the movement of chemicals has been on the influence of steady water flow. Recently approximations have been made to give better solutions for non-steady flows. In principle, flow models can be used to describe the processes of soil formation; however, the complexity of such mathematical models may be prohibitive. (Knapp-USGS)  
W73-07905

**SYSTEMS ANALYSIS IN IRRIGATION AND DRAINAGE,**  
California Univ., Riverside. Dry-Lands Research Inst.

For primary bibliographic entry see Field 03F.  
W73-07923

## WATER CYCLE—Field 02

### Water in Soils—Group 2G

**RADIONUCLIDE DISTRIBUTION IN SOIL MANTLE OF THE LITHOSPHERE AS A CONSEQUENCE OF WASTE DISPOSAL AT THE NATIONAL REACTOR TESTING STATION.**  
Idaho Operations Office (AEC), Idaho Falls.  
For primary bibliographic entry see Field 05B.  
W73-07958

**CONTRIBUTION TO THE STUDY OF THE MIGRATION OF RU106 IN SOILS,**  
Commissariat à l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucléaires.  
For primary bibliographic entry see Field 05B.  
W73-07963

**STATE-OF-THE-ART REVIEW OF THE DEFINITION OF QUALITY OF A SOIL SAMPLE AND MODERN TECHNIQUES OF SOIL SAMPLING,**  
Technische Universität, Berlin (West Germany).  
For primary bibliographic entry see Field 08D.  
W73-08063

**THE ADAPTATION OF CRITICAL STATE SOIL MECHANICS THEORY FOR USE IN FINITE ELEMENTS,**  
For primary bibliographic entry see Field 08D.  
W73-08066

**INFLUENCE OF 'BOUND' WATER ON THE CALIBRATION OF A NEUTRON MOISTURE METER,**  
Ibadan Univ., (Nigeria). Dept. of Agronomy.  
O. Babalola.  
Soil Science, Vol 114, No 4, p 323-324, October 1972. 1 fig, 1 tab, 3 ref.

Descriptors: \*Nuclear moisture meters, \*Calibrations, \*Soil moisture meters, \*Water of hydration, Sorption, Clays, Clay minerals, Water of crystallization, Adsorption.  
Identifiers: Bound water.

The calibration of a neutron moisture meter relates the count ratio to the volumetric content of water in soil dried at 105 deg C, the usual oven temperature. The count ratio that corresponds to a particular moisture content is influenced by the presence of hydrogen atoms as one of the components of clay lattice and organic matter present in the soil, the soil bulk density and certain elements in the soil which have a high capacity for capture of thermal neutrons. Heating Mashi soil to 600 deg C revealed appreciable quantities of bound water in quantities varying with depth. The neutron moisture meter was equally sensitive to these as to the water content as usually defined. The amount of bound water seems to correlate with the clay content. Although the measurement of an absolute soil water content, which does not indicate the amount of plant available water, is not essential in crop water consumption studies, it may more accurately define the calibration relationship when a profile is nonuniform and generally high in clay content and make the calibration for individual soil horizons unnecessary. (Knapp-USGS)  
W73-08087

**APPLICATION OF RHEOLOGICAL MEASUREMENTS TO DETERMINE LIQUID LIMIT OF SOILS,**  
Central Building Research Inst., Roorkee (India).  
R. B. Hajela, and J. M. Bhatnagar.  
Soil Science, Vol 114, No 2, p 122-130, August 1972. 7 fig, 2 tab, 9 ref.

Descriptors: \*Rheology, \*Liquid limits, \*Soil properties, \*Soil tests, Hysteresis, Laboratory tests, Shear, Shear strength, Viscosity, Stress, Clays, Soils.

The flow properties of clay paste from red, black and alluvial soils containing different clay minerals

at small shearing stresses were studied using a viscometer. The Bingham yield stress obtained by extrapolation of the hysteresis curve of clay water system when plotted against moisture content in the soil gives an inflection at a moisture content corresponding to liquid limit of the soil. The results obtained by this method are comparable within 1% of those obtained by the Cup method. The Bingham yield stress at liquid limit was also found to be in conformity with the reported values. (Knapp-USGS)  
W73-08089

**GLOSSARY OF TERMS IN SOIL SCIENCE.**  
Canada Department of Agriculture Publication 1459, 1972. 66 p, 1 fig.

Descriptors: \*Data collections, \*Soil science, Translations, Canada.  
Identifiers: \*Glossaries.

The present glossary of technical terms used in soil science in Canada updates a preliminary edition of the glossary, based largely upon the glossary of the Soil Science Society of America (Soil Sci. Soc. Amer. Proc. 29:330-351, 1965) and printed in English as Part II of the Proceedings of the Canadian Society of Soil Science, 1967. The glossary is published by the Research Branch of the Canada Department of Agriculture in English and French. In the English edition the French equivalents follow the English terms. In the French edition the English equivalents follow the French terms. (Jesfson-USGS)  
W73-08161

**EFFECT OF IRRIGATION TREATMENTS FOR APPLE TREES ON WATER UPTAKE FROM DIFFERENT SOIL LAYERS,**  
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).

For primary bibliographic entry see Field 03F.  
W73-08327

**AN IMPROVED VARIABLE-INTENSITY SPRINKLING INFILTROMETER,**  
Hebrew Univ., Jerusalem (Israel). Dept. of Soil Science.  
For primary bibliographic entry see Field 07B.  
W73-08340

**THEORY OF WATER MOVEMENT IN SOILS: 8. ONE-DIMENSIONAL INFILTRATION WITH CONSTANT FLUX AT THE SURFACE,**  
Connecticut Agricultural Experiment Station, New Haven.  
J.-Y. Parlange.  
Soil Sci, Vol 114, No 1, p 1-4, 1972, Illus.

Identifiers: \*Soil water movement, Absorption, Constant, One-Dimensional, Equation, Flux, \*Infiltration, Integration, Soils, Surface, Theory.

The 1-dimensional movement of water in a porous medium, when the flux of water is imposed at the surface, is solved analytically. The result agrees with the direct numerical integration of the infiltration equation and with results based on similarity arguments in the case of absorption. (See also W72-02728, W73-04106, W73-04225, and W73-05097 thru 05099)—Copyright 1972, Biological Abstracts, Inc.  
W73-08341

**ON TOTAL, MATRIC AND OSMOTIC SUC-**  
**TION,**  
Saskatchewan Univ., Saskatoon.  
J. Krahn, and D. G. Fredlund.  
Soil Science, Vol 114, No 5, p 339-348, November 1972. 10 fig, 1 tab, 19 ref.

Descriptors: \*Moisture tension, \*Osmotic pressure, \*Soil moisture, \*Vapor pressure, Moisture

stress, Osmosis, Water chemistry, Pore water, Laboratory tests, Moisture content, Pore pressure.  
Identifiers: \*Total suction (Soil moisture), \*Osmotic suction (Soil moisture), \*Matric suction (Soil moisture).

Independent measurements were made of matric, osmotic, and total suction where dry density and water content are used as the basis for comparison of all soil suction components. The values of osmotic suction determined on a saturation extract differ significantly from values obtained by using pore water obtained by squeezing. Applying a linear dilution factor to the saturation extract values also produces values that are substantially different from those obtained by the squeezer technique. The values obtained on the squeezed pore fluid were in much closer agreement with the difference between matric and total suction than were the values obtained using the saturation extract techniques. The squeezer technique appears to be a satisfactory way of obtaining pore fluid for the determination of the osmotic suction. The sum of independent measurements of matric and osmotic suction is equal to the measured total suction. Therefore, the generally accepted subdivision of total suction is experimentally verified. For remolded, compacted soils, the matric and total suctions are dependent on the molding water content but essentially independent of the dry density. (Knapp-USGS)  
W73-08349

**SULFIDE DETERMINATION IN SUBMERGED SOILS WITH AN ION-SELECTIVE ELECTRODE,**  
Ministry of Agriculture, Cairo (Egypt).  
For primary bibliographic entry see Field 02K.  
W73-08351

**SOIL STRUCTURE AND ITS EFFECTS ON HYDRAULIC CONDUCTIVITY,**  
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.  
P. Basak.  
Soil Science, Vol 114, No 6, p 417-422, December 1972. 6 fig, 1 tab, 9 ref.

Descriptors: \*Hydraulic conductivity, \*Particle shape, \*Clay minerals, \*Anisotropy, \*Soil water movement, Permeameters, Permeability, Soil structure, Porosity.

Soil structure influences coefficients of radial and vertical conductivity. The flaky shape of clay particles and their orientation give more hydraulic conductivity in the horizontal than in the vertical direction. The hydraulic conductivity ratio increases as the void ratio or porosity decreases. (Knapp-USGS)  
W73-08352

**ESTIMATION OF THE SOIL MOISTURE CHARACTERISTIC AND HYDRAULIC CONDUCTIVITY: COMPARISON OF MODELS,**  
Agricultural Research Service, Beltsville, Md.  
A. S. Rogowski.  
Soil Science, Vol 114, No 6, p 423-429, December 1972. 4 fig, 12 ref.

Descriptors: \*Soil water movement, \*Mathematical models, \*Hydraulic conductivity, Porosity, Soil moisture, Saturation, Unsaturated flow, Saturated flow, Reviews.

Three ways of modeling the moisture characteristic and two ways of modeling hydraulic conductivity of soils are compared. A modified Brooks and Corey conductivity model and the moisture characteristic associated with it are quite similar in form to a modified (ASR) pore-size interaction model of Green and Corey. The results from both compare well with experimental values

## Field 02—WATER CYCLE

### Group 2G—Water in Soils

at higher moisture contents. However, the ASR model approximates the experimental results better at lower values of water content and over a wider moisture range. The moisture content and pressure at air entry are significant parameters of the soil water system. A linear model of the soil moisture characteristic underestimates experimental results when used as input into the modified pore-size interaction model of hydraulic conductivity. (Knapp-USGS) W73-08353

**PROCEDURE AND TEST OF AN INTERNAL DRAINAGE METHOD FOR MEASURING SOIL HYDRAULIC CHARACTERISTICS IN SITU**, Hebrew Univ., Rehovot (Israel). Dept. of Agriculture. D. Hillel, V. D. Krentos, and Y. Stylianou. Soil Science, Vol 114, No 5, p 395-400, November 1972. 5 fig, 2 tab, 17 ref.

Descriptors: \*Soil water movement, \*Soil moisture, \*On-site tests, Hydraulic conductivity, Moisture tension, Percolation, Unsaturated flow, Moisture content.

A simplified procedure is given for determining the intrinsic hydraulic properties of a complete soil profile in situ. The need for determining the hydraulic properties of soil profiles in the field and available methods are reviewed. The vertical transient-state internal drainage process of the soil is analyzed. An instantaneous profile method for determining soil hydraulic properties is based on simultaneously monitoring the changing wetness and matric suction profiles during internal drainage. The experimental procedure and a technique for handling the data are described and illustrated. The method is not applicable where lateral movement of soil moisture is appreciable, but it is otherwise not limited to homogeneous profiles and can serve for layered profiles. The method is simple and practical enough for routine use. The relation of hydraulic conductivity to wetness can be applied to the analysis of drainage and evapotranspiration in actual field management. (Knapp-USGS) W73-08354

**WIND ERODIBILITY AS INFLUENCED BY RAINFALL AND SOIL SALINITY**, Agricultural Research Service, Manhattan, Kans. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 02J. W73-08355

**EQUATION FOR DESCRIBING THE FREE-SWELLING OF MONTMORILLONITE IN WATER**, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. D. H. Fink, and F. S. Nakayama. Soil Science, Vol 114, No 5, p 355-358, November 1972. 1 fig, 1 tab, 6 ref.

Descriptors: \*Expansive clays, \*Hydration, \*Mineralogy, \*Montmorillonite, Osmosis, Adsorption, Expansive soils, Hysteresis, Soil physics.

The hydration and swelling properties of a soil depend in large part on the type (as well as the total amount) of colloidal material present. A theoretical equation was developed to describe the linear expansion of free-swelling Na- and Li-saturated montmorillonite clays in water. The equation permits a quantitative differentiation of the water of clay-swelling into three distinct parts: (1) water associated with free-swelling internal surfaces; (2) water associated with limited-swelling internal surfaces and with high-energy adsorption sites; and (3) external water associated with extraparticle surfaces and voids. This technique also should be applicable for studying the hydration properties of

the component clay minerals in clay type mixtures which contain montmorillonite. (Knapp-USGS) W73-08356

**PLANT SUCCESSION ON TUNDRA MUDFLOWS: PRELIMINARY OBSERVATIONS**, Carleton Univ., Ottawa (Ontario). Dept. of Biology. J. D. H. Lambert. Arctic Inst North Am. Vol 25, No 2, p 99-106, 1972. Illus. Identifiers: Grasses, Herbs, \*Mudflows, \*Plant succession, Sedges, Soil, Succession, \*Tundra, Soil types, \*Canada.

Tundra mudflows are one of the characteristic features of arctic slopes with unstable soils. They generally occur during the early part of the thaw period, but may occur after a heavy rainfall. Only 2 relatively short-lived vegetation elements were evident and both are characteristic of disturbed sites. Islands of vegetation and soil of the type that dominate the slope before the mudflow are left scattered within the flow lines. Once a turf of grasses, sedges and herbs has formed the island vegetation is able to colonize the turf mat. Areas where previous mudflows have occurred are clearly recognizable both by a long depression parallel to the direction of the slope and terminal fan of debris. Detailed studies on such naturally occurring phenomena would be of great value in view of increased use of heavy vehicular equipment by the oil and mining companies in the Canadian North. Copyright 1973, Biological Abstracts, Inc. W73-08409

**ANNUAL CYCLES OF SOIL MOISTURE AND TEMPERATURE AS RELATED TO GRASS DEVELOPMENT IN THE STEPPE OF EASTERN WASHINGTON**, Washington State Univ., Pullman. Dept. of Botany. R. Daubenmire. Ecology. Vol 53, No 3, p 419-424. 1972. Illus. Identifiers: Grass, \*Soil moisture, Phenology, Soil profiles, Soils, \*Steppe, Soil temperature, \*Washington.

The annual cycle of soil moisture use and recharge was followed in 8 climax steppe communities by making gravimetric analyses to a depth of 1 m. Soil temperatures were measured at depths of 50 and 100 cm. The data were related to the phenologies of the dominant grasses. Differences in soil moisture and temperature seem to contribute more toward explaining the distributions of these steppe communities than do chemical content of the soils or their profile characters. Copyright 1973, Biological Abstracts, Inc. W73-08436

**AVAILABLE SOIL MOISTURE AND PLANT COMMUNITY DIFFERENTIATION IN DAVIES ISLAND, MIDDLE TENNESSEE**, Tennessee Technological Univ., Cookeville. S. M. Stubblefield, and S. K. Ballal. Trans Am Acad Sci. Vol 47, No 3, p 112-117. 1972. Illus. Identifiers: \*Soil moisture, Beech, Cedar, \*Davies Island (Tenn), Differentiation, Hickory, Islands, Maple, Oak, Plant communities, Soils, \*Tennessee, Vegetation, Soil types.

One of the dominating factors determining community differentiation is available soil moisture, which is intimately coupled with soil types. The moisture contents of various soil types found at Davies Island located in the Center Hill Reservoir are determined and correlated with the vegetational types supported by such soils. Species of plants found in 4 sites, namely a beech-maple complex, an oak-hickory complex, old fields, and cedar woods are listed, and their occurrence is discussed

in relation to the available soil moisture. Copyright 1973, Biological Abstracts, Inc. W73-08440

### 2H. Lakes

**ORGANIC WASTES AS A MEANS OF ACCELERATING RECOVERY OF ACID STRIP-MINE LAKES**, Missouri Univ., Columbia. Dept. of Civil Engineering. For primary bibliographic entry see Field 05G. W73-07808

**WATER QUALITY CHANGES IN AN IMPOUNDMENT AS A CONSEQUENCE OF ARTIFICIAL DESTRATIFICATION**, North Carolina Univ., Chapel Hill. School of Public Health. For primary bibliographic entry see Field 05C. W73-07818

**EXTRAPOLATION OF INDICATOR SCHEMES WITHIN SALT MARSHES**, Moskovskoe Obshchestvo Ispytatelei Prirody (USSR). Geographic Div. M. A. Monakhov.

In: *Landscape Indicators—New Techniques in Geology and Geography*: Consultants Bureau, Div of Plenum Press, London and New York, p 141-147, 1973. 52 ref. (Translated from Russian. Proceedings of Conference of Moscow Society of Naturalists, May 21-22, 1968, Moscow, Nauka Press).

Descriptors: \*Terrain analysis, \*Vegetation effects, \*Salt marshes, Salt tolerance, Vegetation, Aerial photography, Remote sensing, Wetlands, Salinity, Chlorides, Sulfates, Sodium, Calcium. Identifiers: \*USSR.

Landscape indicator schemes may be used in some types of salt flats. Wet, incrustated or armored layers are barren of vegetation. In wet salt marsh with glasswort and annual species of *Suaeda*, the salt is chloride, mostly sodium chloride, and salinization is sometimes merely surficial, possibly diminishing appreciably with depth. In hummocky salt marsh with *Halocnemum* the salt is chloride; but with considerable sulfate content it is chiefly sodium chloride with appreciable calcium. In hilly or hummocky salt marshes, with hummocks about clumps of tamarisk, niter bush, and boxthorn, chlorides and sulfides are almost equally represented in the salts. This type of salt marsh is commonly combined with hummocky marshes with *Halocnemum*. In salt-marsh meadows with species of *Puccinellia* and *Aeluropus*, salt is chiefly sulfate. (Knapp-USGS) W73-07848

**TRANSIENT AND STEADY-STATE SALT TRANSPORT BETWEEN SEDIMENTS AND BRINE IN CLOSED LAKES**, Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences. A. Lerman, and B. F. Jones. Limnology and Oceanography, Vol 18, No 1, p 72-85, January 1973. 5 fig, 1 tab, 11 ref.

Descriptors: \*Salinity, \*Saline lakes, \*Ion transport, \*Bottom sediments, Sedimentation, Leaching, Brines, Connate water, Ion exchange, Limnology, Diffusion, \*Oregon, Saline water, Lakes, Salts. Identifiers: \*Lake Abert (Oregon).

A diffusional transport model predicts the rates of salt transport from pore fluids into lake waters. In a lake without outflow, dissolved salts may migrate across the sediment-water interface in response to a concentration difference between

lake and interstitial brine. Transport of salt upward is transient; its direction can be reversed by external input of salt or by depletion of salts stored in the sediments, and a steady-state concentration in lake water is not attainable. Downward transport can be a stationary process if the sedimentation rate is rapid compared with molecular diffusion of salt in interstitial brine, but characteristic rates are too slow to lead to steady-state concentrations within the lifetime of a closed lake. In Lake Abert, Oregon, diffusional flux upward was much more important than input of salt from other sources; 45% of the salt of lake brine in 1963-1964 was added from the sediment pore space during the preceding 25 years, only 0.1% from external inflow. The sediment source will dominate input during high water level. (Knapp-USGS)  
W73-07850

**THE ST. CLAIR RIVER DELTA: SEDIMENTARY CHARACTERISTICS AND DEPOSITIONAL ENVIRONMENTS.**  
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.  
For primary bibliographic entry see Field 02J.  
W73-07858

**LAKES OF BELORUSSIA (BELORUSSKOE PZOOR'YE).**  
Belorussian State Univ., Minsk (USSR). Laboratoriya Ozerovedeniya.  
O. F. Yakushko.  
Izdatel'stvo "Vysheyshaya Shkola", Minsk, 1971. 336 p.

Descriptors: \*Limnology, \*Paleolimnology, \*Lakes, \*Lake morphometry, \*Lake morphology, Lake stages, Lake basins, Lake sediments, Sediment distribution, Particle size, Thermal properties, Water levels, Water properties, Water chemistry, Biology, Aquatic life, Geomorphology, Hydraulics, Hydrology, Geologic time.  
Identifiers: \*USSR, \*Belorussia, Lake classifications, Macrophytes, Isopleths.

Present conditions of lakes in northern Belorussia are considered against the background of their origin and history in the Upper Pleistocene and Holocene. Morphometric, geomorphological, hydrological, hydrochemical, and biological indices are used to classify the lakes on the basis of nutrient content. The regional classification of lakes, based on a complex of geographical and limnological indices, reflects the interrelations of lake-basin morphology and dynamics of water mass to the hydrological, hydrochemical, and biological features of lakes, and to the character of sediment accumulation. (Josephson-USGS)  
W73-07907

**PRODUCTIVITY OF FRESH WATERS.**  
G. Marier.  
Nat Belg. Vol 52, No 6, p 281-295, 1971. Illus.  
Identifiers: \*Daphnia, \*Insect, Larvae, Phytoplankton, \*Productivity, Rotifers, \*Zooplankton.

Phytoplankton, Cladocera (Daphnia), zooplankton, rotifers, insect larvae and others were studied in Mirwan pond to understand the paths which energy takes through the biocoenosis before becoming dissipated as heat, and of the routes which materials follow through the pond life before returning to their original state.—Copyright (c) 1972, Biological Abstracts, Inc.  
W73-07930

**INTERACTION OF YELLOW ORGANIC ACIDS WITH CALCIUM CARBONATE IN FRESH-WATER.**  
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.  
For primary bibliographic entry see Field 05B.  
W73-07931

**CHALK RIVER NUCLEAR LABORATORIES PROGRESS REPORT APRIL 1 TO JUNE 30, 1972, BIOLOGY AND HEALTH PHYSICS DIVISION, ENVIRONMENTAL RESEARCH BRANCH AND HEALTH PHYSICS BRANCH.**  
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.  
For primary bibliographic entry see Field 05C.  
W73-07955

**BACTERIAL AND ALGAL CHLOROPHYLL IN TWO SALT LAKES IN VICTORIA, AUSTRALIA.**  
For primary bibliographic entry see Field 05A.  
W73-08018

**REEDS CONTROL EUTROPHICATION OF BALATON LAKE,**  
Research Inst. for Water Resources Development, Budapest (Hungary).  
For primary bibliographic entry see Field 05G.  
W73-08025

**THE LITTORAL MICROPHYTIC VEGETATION OF LAKE OHRID (IN SERBO-CROATIAN).**  
Hidrobioloski Zavod, Ochrida (Yugoslavia).  
For primary bibliographic entry see Field 05C.  
W73-08061

**REPRODUCTION OF LAKE SEVAN KHRAMULYA (IN RUSSIAN),**  
E. M. Malkin.  
Tr. Molodyykh Uch. Vses. Nauchno-Issled. Inst. Morsk Rybn. Khoz Okeanogr. 3. p 147-157, 1970. English summary.  
Identifiers: Lakes, \*Reproduction, \*USSR, \*Lake Sevan Khramulya.

Analysis of the structure of the spawning and fatening stages in the period preceding the start of spawning established the absence of spawning gaps in sexually mature khramulya. There were no strictly river spawning stages in khramulya, but another stage evidently exists, part of which involves spawning in rivers while another part involves spawning near the mouths of lakes.—Copyright 1972, Biological Abstracts, Inc.  
W73-08104

**ECOLOGICAL NOTES ON A LAKE-DWELLING POPULATION OF LONGNOSE DACE (RHINICHTHYS CATARACTAE),**  
Manitoba Univ., Winnipeg. Dept. of Zoology.  
J. H. Gee, and K. Machniak.  
J. Fish Res Board Can. Vol 29 No 3, p 330-332. 1972. Illus.  
Identifiers: \*Dace, \*Fish physiology, Ecology, Lakes, Fish population, Rhinichthys cataractae, Spawning.

Longnose dace were found from early July to Sept. in onshore waters on the east side of Hecla island in the southern basin of Lake Winnipeg. They were most abundant on rocky substrates, where they spawned in early July. It is suggested that at other times of the year these fish occupy deep channels between islands where current is present. While in onshore waters fish less than 5 g adjusted their buoyancy by altering swimbladder volume in response to presence or absence of wave action. Swimbladder volume was similar to that of river-dwelling populations of this species.—Copyright 1972, Biological Abstracts, Inc.  
W73-08130

**THE FORMATION OF IRON AND MANGANESE-RICH LAYERS IN THE HOLOCENE SEDIMENTS OF THUNDER BAY, LAKE SUPERIOR,**  
Lakehead Univ., Thunder Bay (Ontario).  
For primary bibliographic entry see Field 02J.  
W73-08135

**THE RESULTS OF INTRODUCING MONODACNA COLORATA EICHW. INTO THE ZAPOROZHE RESERVOIR, (IN RUSSIAN),**  
Dnepropetrovskii Gosudarstvennyi Universitet (USSR). Institut Gidrobiologii.

I. P. Lubyanov, V. L. Bulakhov, and V. I. Zolotareva.  
Gidrobiol. Zh. Vol 8 No 1, p 103-105. 1972.  
Identifiers: Fish food, \*Monodacna-colorata, Reservoirs, USSR, \*Zaporozh'e Reservoir.

One promising method of enriching the natural food base of fish is the acclimatization of estuarine Caspian invertebrates. Data on the location, living conditions, density, morphological characteristics, growth rate and age composition suggest that *M. colorata* has not only survived in the reservoir, but is in one of the final stages of acclimatization and naturalization.—Copyright 1972, Biological Abstracts, Inc.  
W73-08136

**LAKE SURVEY CENTER 1972 RESEARCH PROGRAM.**  
National Ocean Survey, Detroit, Mich. Lake Survey Center.

Available NTIS, Springfield, Va. 22151 as COM 72-10677 Price \$3.00 printed copy; \$1.45 microfiche. Technical Memorandum NOS LSCD 2, January 1972. 59 p, 2 fig.

Descriptors: \*Limnology, \*Great Lakes, \*Hydrology, \*Data collections, Lake morphology, Currents (Water), Water supply, Water quality, Water pollution effects, Environmental effects, Ice-water interfaces, Snow, Streamflow, Inflow, Shores, Shore protection, Sediment transport, Sedimentology, Water level fluctuations, Waves (Water), Precipitation (Atmospheric), Evaporation, Mathematical models.

The Great Lakes research program of the Limnology Division of NOAA consists of data collection, investigations, and studies in five specific fields: water motion within the lakes and connecting rivers; lake water characteristics and their relationships to natural and manmade processes; limnogeology, including interaction of water masses with shoreline and lake bottom; lake hydrology and factors affecting water supply to lakes including effects of ice cover and snow accumulation; and limnologic systems studies with the aim of establishing complex interrelationships that exist between individual processes within the Great Lakes and their immediate environment. All research investigations are closely coordinated with other agencies and educational institutions engaged in related work. For example, cooperative programs of data collection have been established with the Corps of Engineers, EPA, AEC, the University of Michigan, Canadian Department of Transport, the University of Toronto, and others. The techniques, facilities, and equipment used in the data collection investigations are described. (Woodard-USGS)  
W73-08160

**CHARACTERISTICS OF TWO DISCRETE POPULATIONS OF ARCTIC CHAR (SALVELINUS ALPINUS L.) IN A NORTH SWEDISH LAKE,**  
N. A. Nilsson, and O. Filipason.  
Ref Inst Freshwater Res Drottningholm. 51 p 90-108. 1971. Illus.  
Identifiers: Arctic, \*Char, Daphnia, Discrete, Scandinavia fish diets, Gammarus, Fish growth, Lakes, \*Fish populations, Salvelinus alpinus.

Several subpopulations of arctic char have long been recognized in Scandinavia by both local fishermen and biologists. A description is given of 2 populations in a lake in southern Swedish Lapland, referred to as 'ordinary char' and 'blattjea.' The 2 forms could be distinguished from the shape of their otoliths, 1 type being characterized as 'ar-

## Field 02—WATER CYCLE

### Group 2H—Lakes

row-shaped' (ordinary char), the other as 'drop-shaped' (blattjen). A slight difference in gillraker counts of the 2 populations could be discerned, but none for pyloric caeca. Coloration of the 2 populations at spawning time is different, as is flesh coloration in autumn. Most ordinary char were caught with floated gill nets in the pelagic; most blattjen with sinking nets in the littoral region of the lake. In autumn ordinary char fed on planktonic Crustacea, mainly *Daphnia*, while blattjen fed on bottom animals, mainly *Gammarus*. Even fish that were caught at the same stations in the littoral region displayed a similar food segregation. There was a highly significant difference in growth rate between the 2 forms, the ordinary char being more fast-growing than the blattjen. Ordinary char caught with sinking gill nets as well as blattjen display a greater variability in growth rate than do char caught with floated nets. A greater fraction of the stomachs of the ordinary char had a high degree of filling as compared with blattjen. It is suggested that differences in stomach fullness as well as in growth rates result from a more severe competition between brown trout and blattjen. There was an evident difference in the average size of the spawning fish belonging to the different populations, the blattjen being smaller at maturity. They were on average older than the ordinary char at maturity. The 2 populations are regarded as separate species. Although there are many parallels with the char populations of other lakes in Scandinavia, further analysis is needed before detailed generalization as to the whole complex can be made.—Copyright 1972, Biological Abstracts, Inc.  
W73-08244

**EUTROPHICATION AND LOUGH NEAGH,**  
New Univ. of Ulster, Coleraine (Northern Ireland).  
For primary bibliographic entry see Field 05C.  
W73-08252

**STIMULATION OF PHYTOPLANKTON GROWTH BY MIXTURES OF PHOSPHATE, NITRATE, AND ORGANIC CHELATORS,**  
Virginia Inst. of Marine Science, Gloucester Point.  
For primary bibliographic entry see Field 05C.  
W73-08253

**ROLE OF PHOSPHORUS IN EUTROPHICATION AND DIFFUSE SOURCE CONTROL,**  
Wisconsin Univ., Madison. Water Chemistry Program.  
For primary bibliographic entry see Field 05C.  
W73-08255

**ECOLOGICAL TOPOGRAPHY OF FISH POPULATIONS IN RESERVOIRS, (IN RUSSIAN),**  
A. G. Podubnyi.  
Nauka: Leningrad. 1971. 312p. Illus.  
Identifiers: \*Abramis-Brama, Book, \*Ecological studies, \*Fish populations, Reservoirs, Topography.

The reservoirs in the Volga system and some other reservoirs, lakes and rivers were studied. Faunal data were obtained by studying the Abramis brama population of the Rybinskii, Gorkii and Kuibyshev reservoirs.—Copyright 1972, Biological Abstracts, Inc.  
W73-08270

**SPAWNING AND SPAWNING GROUNDS OF THE BURBOT LOTA LOTA (L.), (IN RUSSIAN),**  
V. N. Sorokin.  
Vopr Ikhtiol. Vol 11, No 6, p 1032-1041, 1971. Illus.  
Identifiers: \*Burbot, Lakes, Lota-Lota, \*Spawning grounds, USSR, \*Lakes Baikal.

Spawning of the burbot (*Lota lota*) in the Lake Baikal system was investigated. The spawning grounds of the burbot in the Bugul'deika and Kichera rivers are described and information is given on the density of the burbot eggs at the spawning grounds and the characteristics of their development.—Copyright 1972, Biological Abstracts, Inc.  
W73-08277

**STRUCTURE OF SPAWNING SCHOOLS, GROWTH AND SEXUAL MATURATION OF THE BREAM ABRAMIS BRAMA (L.) OF THE KREMENCHUG RESERVOIR, (IN RUSSIAN),**  
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.  
V. P. Bruenko, and I. E. Dyachuk.  
Vopr Ikhtiol. Vol 11, No 6, p 955-968, 1971. Illus.  
Identifiers: Abramis-brama, \*Bream, Growth, \*Kremenchug Reservoir (USSR), Reservoir, \*Sexual maturation, Spawning, USSR.

The dynamics of the sex, size-weight, and age composition of spawning schools of *A. brama* from the time of formation of the Kremenchug reservoir (1962) to the present was investigated. The average age of spawners has increased in recent years in comparison with the early years of existence of the reservoir, but the number of age groups in the spawning population has decreased. The growth rate of the bream has decreased regularly as the reservoir has formed and commercial fish fauna has become established in it. The rate of sexual development is slowing down.—Copyright 1972, Biological Abstracts, Inc.  
W73-08278

**A SURVEY ON CLONORCHIS SINENSIS AND SOME OTHER SPECIES OF METACERCARIAE IN FRESHWATER FISHES FROM LAKE IZUNUMA, MIYAGI PREFECTURE,**  
N. Suzuki.

Res Bull Meguro Parasitol Mus. 5, p 19-20, 1971.  
Identifiers: \*Clonorchis-sinensis, Fishes, Lake Izu-Numa, \*Japan, Lake, \*Metacercariae, Miyagi, Prefecture, Species, Survey.

Scales, fins, opercula and muscles of 5 species of fishes collected from the lake were examined for metacercaria under a dissecting microscope. Four were all found infected with the metacercariae. *Clonorchis* is still present around the lake.—Copyright 1972, Biological Abstracts, Inc.  
W73-08283

**GAMETOGENESIS OF SOCKEYE FRY IN LAKE DALNEM, (IN RUSSIAN),**  
M. Ya. levneva.

Izv Tikhookean Nauchno-Issled Inst Rybn Khoz Okeanogr. 78, p 81-104, 1970. English summary.  
Identifiers: Fecundity, Fishery, Forms, Fry, \*Gametogenesis, Lakes, \*Sockeye fry, USSR, \*Lake Dalnem (USSR).

According to spermatogenesis of sockeye juveniles a stage of gonadal development was exposed for the differentiation of future dwarfs which mature in the lake and juveniles of the migrating portion of the school. The earliest signs indicating transition of a male juvenile to a dwarf is intensive reproduction of spermatogonia beginning less than a year before spawning of dwarfs. In the predownstream migrant period oocytes in the early phases of trophoplasmatic growth are found in both future dwarf females and 3 and 4 yr old downstream migrants. During this period dwarf females are more clearly distinguished from downstream juveniles by their low fecundity.—Copyright 1972, Biological Abstracts, Inc.  
W73-08285

According to spermatogenesis of sockeye juveniles a stage of gonadal development was exposed for the differentiation of future dwarfs which mature in the lake and juveniles of the migrating portion of the school. The earliest signs indicating transition of a male juvenile to a dwarf is intensive reproduction of spermatogonia beginning less than a year before spawning of dwarfs. In the predownstream migrant period oocytes in the early phases of trophoplasmatic growth are found in both future dwarf females and 3 and 4 yr old downstream migrants. During this period dwarf females are more clearly distinguished from downstream juveniles by their low fecundity.—Copyright 1972, Biological Abstracts, Inc.  
W73-08285

### THE BIOLOGY OF LAMPREYS, VOL 1.

Academic Press: London, England; New York, N. Y., 1971. M. W. Hardisty, I. C. Potter, Ed. p 423, Illus. Maps. Pr. \$23.50.  
Identifiers: Biology, \*Distribution, Ecology, \*Embryology, \*Lampreys, Phylogeny, Systematics, \*Great Lakes, Aquatic life.

Information on the systematics, distribution, life histories and ecology of lampreys. A chapter on the distribution, phylogeny and taxonomy of the lampreys is followed by a discussion on lampreys, in the fossil record, including descriptions of fossils, calcifications in the head skeleton of modern lampreys and systematics. Chapter 3 presents a detailed discussion on the behavior, ecology and growth of larval lampreys, followed by a chapter on the general biology of adult lampreys, including downstream migration and parasitic feeding, the spawning phase and the size and sex composition of adult populations. Next, a chapter is presented on sea lampreys in the Great Lakes of North America, including the following aspects; sea lamprey invasion of the Great Lakes; distribution of lampreys in the Great Lakes before effective control; lamprey control; effects of chemical control; biological changes in the sea lamprey; and the future of sea lamprey control in the Great Lakes. Chapter 6, paired species, covers the distribution of species, the basis of brook lamprey evolution and speciation, followed by a discussion in chapter 7 of lamprey chromosomes, including techniques, chromosome numbers, size and form of chromosomes, karyotype evolution and taxonomic considerations. Chapter 8, gonadogenesis, sex differentiation and gametogenesis, covers gonadogenesis and sex differentiation, quantitative aspects of gonadogenesis, gonad development in the post-metamorphic period and the somatic tissues of the gonad. The final chapter, embryology, discusses stages in embryonic development, features of lamprey embryology and experimental investigations.—Copyright 1971, Biological Abstracts, Inc.  
W73-08326

**MACROFAUNA COMMUNITIES OF THE LITTORAL OF MIKOŁAJSKIE LAKE,**  
Polish Academy of Sciences, Warsaw (Poland). Inst. of Experimental Biology.

K. W. Opaliński.  
Pol Arch Hydrobiol. Vol 18, No 3, p 275-285. 1971. Illus.  
Identifiers: Chironomidae, Communities, Lakes, \*Littoral, \*Macro fauna, Mikolajskie Lake (Poland), Habitats.

Discussed are 4 types of macrofauna communities connected with various substrata accessible for colonization in the shallow lake littoral. The tips of last year's reeds, broken under the water surface, are newly discovered habitat. They are colonized by a rich and almost monospecific community of Chironomidae larvae. Only 3 Chironomidae spp. are common for all the 4 communities.—Copyright 1972, Biological Abstracts, Inc.  
W73-08336

**THE CHEMICAL NATURE OF THE SUBSTANCES THAT INDUCE THE REDDING OF LAKE TOVEL: III. STUDY OF A REMARKABLE PHENOMENON OF PRE-REDDING (IN ITALIAN),**  
For primary bibliographic entry see Field 05C.  
W73-08344

**SEASONAL VARIATION OF A LIMNIC BEACH,**  
Catholic Univ. of America, Washington, D.C. Dept. of Geography.  
For primary bibliographic entry see Field 02J.  
W73-08371

## WATER CYCLE—Field 02

### Water in Plants—Group 21

**SIMULATION MODEL FOR STORM CYCLES AND BEACH EROSION ON LAKE MICHIGAN, Williams Coll., Williamstown, Mass.**  
For primary bibliographic entry see Field 02J.  
W73-08375

**STUDIES ON THE PRODUCTIVE STRUCTURE IN SOME LAKES IN KOREA, (IN KOREAN), Seoul National Univ. (Republic of Korea). Dept. of Botany.**  
For primary bibliographic entry see Field 05C.  
W73-08402

**SEASONAL CHANGES IN PHYTOPLANKTON AND WATER CHEMISTRY OF MOUNTAIN LAKE, VIRGINIA, Chana Univ., Legion, Volta Basin Research Project.**  
E. K. Obeng-Asamoah and B. C. Parker.  
Trans Am Microsc Soc. Vol 91, No 3, p 363-380, 1972. Illus.  
Identifiers: Carbon-14, Chlorophyll, Cyclotella-Comta, Lakes, Minerals, "Mountain Lake (Va), Nutrients, Oxygen, "Phytoplankton, Planktosphaeria-Gelatinosa, Primary productivity, "Seasonal, Sphaerocystis-Schroeteri, Trophic, "Virginia.

Mountain Lake is situated at an altitude of about 1180 m above sea level. It is the only natural lake in Virginia and the largest (natural) in the entire unglaciated part of the Appalachians. Its water was slightly acidic, pH ranging between 5.9 and 7.2. Ammonium, nitrates, nitrates, phosphates, dissolved silica, chlorides, sulfates, and ferrous Fe occurred in very low concentrations in the water. Dissolved O<sub>2</sub> curves for the summer were orthograde, and the hypolimnetic O<sub>2</sub> never fell below 8.0 ppm. Areal O<sub>2</sub> deficit calculated for 163 days and 85 days were respectively 0.0019 and 0.0029 mg/m<sup>2</sup>/day. These features all indicate oligotrophy. Phytoplankton populations were sparse and consisted of many species. Desmids dominated in summer, while the diatom *Cyclotella comta* dominated in winter and spring. Two chlorophycean algae, *Sphaerocystis schroeteri* and *planktosphaeria gelatinosa*, occurred throughout the year. The winter flora also included microalgae. Primary productivity studies, using chlorophyll, O<sub>2</sub>, and <sup>14</sup>C methods, yielded low values, but showed highest productivity in the metalimnion which correlated with O<sub>2</sub> supersaturation there. *Cyclotella* cell counts and size-range, and the microalgae under the ice in winter, suggest high winter productivity which may be heterotrophic.—Copyright 1973, Biological Abstracts, Inc.  
W73-08404

**LAKE SEDIMENTS IN NORTHERN SCOTLAND, Leicester Univ. (England).**  
For primary bibliographic entry see Field 02J.  
W73-08425

**STUDIES ON BIOLOGICAL METABOLISM IN A MEROMICTIC LAKE SUIGETSU, Nagoya Univ. (Japan). Water Research Lab.**  
For primary bibliographic entry see Field 05C.  
W73-08429

**ECOLOGY OF ARBOVIRUSES IN A MARYLAND FRESHWATER SWAMP: I. POPULATION DYNAMICS AND HABITAT DISTRIBUTION OF POTENTIAL MOSQUITO VECTORS, Walter Reed Army Inst. of Research, Washington, D.C.**  
For primary bibliographic entry see Field 05C.  
W73-08446

**ECOLOGY OF ARBOVIRUSES IN A MARYLAND FRESHWATER SWAMP: II. BLOOD**

**FEEDING PATTERNS OF POTENTIAL MOSQUITO VECTORS, Walter Reed Army Inst. of Research, Washington, D.C.**  
For primary bibliographic entry see Field 05B.  
W73-08447

### 21. Water in Plants

**CONDITION OF THE FOOD BASE OF PLANKTOPHAGIC FISH IN ARAKUMSK BODIES OF WATER, (IN RUSSIAN), O. N. Nasukhov.**

Tr Vses Nauchno-Issled Inst Prudovogo Rybn Khoz. 18 p, 149-154. 1971. (English summary).  
Identifiers: "Algae, "Arakumsk, Blue-green algae, Cladocera, Copepoda, Diatoms, Fish, Food, "Planktophagous, Fish, Rotifer, USSR, Deltas.

The Arakumsk bodies of water are located in the Terek River delta and have an area equal to 16,700 ha. Species diversity was pronounced in stations located in reed thickets. The maximum index of biomass during the period of observation was observed in the lower body of water. Juvenile fish in these waters fed mainly on Cladocera and Copepoda. Rotifers, blue-green and diatomous algae were also found in the stomachs of young fish.—Copyright 1972, Biological Abstracts, Inc.  
W73-07832

**THE INFLUENCE OF WEATHER UPON THE ACTIVITY OF SLUGS, Birmingham Univ. (England). Dept. of Genetics. T. J. Crawford-Sidebotham.**  
Oecologia (Berl). Vol 9, No 2, p 141-154. 1972.  
Identifiers: *Arion hortensis*, *Arion subfuscus*, *Milax budapestensis*, "Slugs, "Weather.

The activity of slugs was measured by a catch per unit effort sampling system based upon night searching, and was related to the microclimatological conditions in the habitat by regression analysis. The activity of *Arion hortensis* Fer., *A. subfuscus* (Drap.), *A. lusitanicus* Mab., *Milax budapestensis* (Hazay), and of all slugs irrespective of species, was best related to temperature and vapor pressure deficit. The relevance of these results to the application of effective methods for the control of slugs is discussed.—Copyright 1972, Biological Abstracts, Inc.  
W73-08012

**COMPARATIVE BEHAVIOR AND HABITAT UTILIZATION OF BROOK TROUT (SALVELINUS FONTINALIS) AND CUTTHROAT TROUT (SALMO CLARKI) IN SMALL STREAMS IN NORTHERN IDAHO, J. S. Griffith, Jr.**

J Fish Res Board Can. Vol 29, No 3, p 265-273. 1972.  
Identifiers: "Fish behavior, Brook trout, Cutthroat trout, Habitats, "Idaho, *Salmo clarki*, *Salvelinus fontinalis*, Streams, "Trout.

Individual *S. fontinalis* and *S. clarki* trout communicated with similar behavioral signals, both in laboratory stream-channels and in northern Idaho streams. Underyearling brook trout were less active socially than equal-sized cutthroat trout in laboratory observations. In study streams, brook trout maintained a 20-mm size advantage over cutthroat of the same age-groups throughout their lives, as they emerged from the gravel before cutthroat. Because of this size advantage, underyearling brook trout of sizes found in study streams in Sept. consistently dominated in experiments the underyearling cutthroat with which they normally lived. But in study streams underyearlings of the 2 spp. utilized different microhabitats, particularly with respect to water depth, and so minimized chances for interaction. Yearlings and older brook trout initiated 40%

fewer aggressive encounters under laboratory conditions than did equal-sized cutthroat, and did not displace the cutthroat. In study streams with sympatric populations, cutthroat trout of these age-groups occupied territories with focal points of higher water velocities (averaging 10.2-10.3 cm/sec) than those occupied by brook trout (averaging 7.6-9.6 cm/sec). Considerable interspecific overlap in other habitat characteristics occurred for trout of age-groups I and II. The oldest members of the 2 spp. segregated more distinctly, as the brook trout lived closer to overhead cover. Copyright 1972, Biological Abstracts, Inc.  
W73-08158

**THE VALUE OF SOME QUALITY INDEX NUMBERS OF SOME MARSH PLANTS OF THE DANUBE DELTA, Societatea de Științe Biologice din R.S.R., Bucharest.**

G. Tarta.  
Comun Bot. 12: p 539-544. 1971. Illus. English summary.  
Identifiers: "Nutrients, *Carex pseudocyperus* M, "Danube Delta, "Marsh plants, *Phragmites communis* M, *Plants*, Protein, Romania, *Scirpus lacustris* M, *Typha angustifolia* M, Index numbers.

Nutritional components of *Phragmites communis*, *Typha angustifolia*, *Scirpus lacustris* and *Carex pseudocyperus* were studied. Young *P. communis* was richest in nutrients: *Typha* and *Scirpus* were medium and *Carex* was very low. The protein index number changes in accordance with the vegetation period.—Copyright 1972, Biological Abstracts, Inc.  
W73-08242

**THE FISH FAUNA OF NERA RIVER AND ITS PROTECTION, (IN RUMANIAN)**  
Academia R.S.R., Bucharest. Institutul de Biologie.  
For primary bibliographic entry see Field 05G.  
W73-08269

**SEASONAL AND AGE-RELATED CHANGES IN THE DIET OF SILVER SALMON IN THE PLOTNIKOV AND AVECHE RIVERS, (IN RUSSIAN), Z. K. Zorbidi.**

Izv Tikhookean Nauchno-Issled Inst Khoz Okeanogr, Vol 78, p 129-150. 1970. English summary.  
Identifiers: "Age, Avcche River, Plotnikov River, Salmon, "Seasonal, "Silver salmon, USSR, "Fish diets.

In the spring-summer period silver salmon feeding in the river is characterized by high indices of gastric accumulation. The species composition of the consumed organisms and dimensions of the same species change according to the season. The differences exist in the diet of silver salmon young of different age groups.—Copyright 1972, Biological Abstracts, Inc.  
W73-08272

**BIOLOGY OF PACIFIC LAMPREY LARVAE, (IN RUSSIAN), V. G. Svirskii.**

Uch Zap Dal'nevost Univ., Vol 15, No 3, p 114-119. 1971.  
Identifiers: "Biology, "Khabarovsk (USSR), "Lamprey larvae, "Pacific lamprey, USSR, Wintering.

Wintering larvae of the Pacific lamprey were found in the area of Khabarovsk on a branch of the Tala. In particular many ammonocetes were observed in the littoral area at ground water outlets. Movement to these areas was associated with a decreased O<sub>2</sub> content in the winter period of 0.7-0.2 mg/l, which was the main reason for the death of lampreys in water bodies associated with the Amur. Lamprey wintered in the ground; they

## Field 02—WATER CYCLE

### Group 21—Water in Plants

reached 2960 specimen/m<sup>2</sup> in some areas. A small portion of the head protruded from the ground with the oral funnel. In contrast to larvae, young lamprey which had completed metamorphosis never buried themselves in the sand. Metamorphosis of Pacific lamprey larvae began in the first days of Dec. The sexual ratio in larvae was about 1:1. Determination of sex began at a length of 80-90 mm.—Copyright 1972, Biological Abstracts, Inc. W73-08273

**CONTRIBUTIONS TO THE KNOWLEDGE OF THE GREEN FROG PARASITE-FAUNA (RANA RIDIBUNDA AND RANA ESCULENTA) FROM THE DANUBE FLOODED LAND AND DELTA, (IN RUMANIAN),**  
Ion Radulescu, E. Cristea, A. Cristea, and B. Demetru.

Bul Cercel Piscic. Vol 29, No 3, p 92-96, 1970. English summary.

Identifiers: Acanthocephala, \*Danube, Delta, Fauna, \*Frogs (Green), Land, Nematodes, Parasites, Protozoa, \*Rana-Esculenta, \*Rana-Ridibunda, Trematodes.

A study made in 1968 on 67 adult frogs (R. ridibunda and R. esculenta) captured in 2 different biotopes showed infestation (86.16%) with protozoans, trematodes, nematodes and acanthocephala. The principal ways of infesting the frog with parasites are presented, as well as the possibilities of controlling them. The best frogs for eating and marketing are considered those captured during cold seasons, when infestation is reduced.—Copyright 1972, Biological Abstracts, Inc. W73-08280

**HELMINTH FAUNA OF BIRDS OF TWO POND SYSTEMS OF THE MILICZ PONDS RESERVE,**  
Szkoła Główna Gospodarstwa Wiejskiego, Warsaw (Poland).

T. Sulgostowska, and W. Korpaczewska. Acta Parasitol Pol. Vol 20, No 1-11, p 75-94, 1972. Illus.

Identifiers: Acanthocephalan, Birds, Cestode, \*Dubininolepis podicipina, Fauna, \*Helminth fauna, Milicz, Nematodes, \*Poland, Ponds, Trematode.

Examination of 281 birds of 8 families revealed 27 trematode, 40 cestode, a nematode and an acanthocephalan species. A trematode and 2 cestode species are new records for Poland. New hosts were recorded for 8 trematode and 7 cestode species in Poland, 5 trematode and 10 cestode species are reported from new hosts. Dubininolepis podicipina is regarded a valid species. The cestode fauna was much more numerous than that of trematodes, both as regards incidence and intensity of infection.—Copyright 1972, Biological Abstracts, Inc. W73-08281

**SCOLYTIDAE (COLEOPTERA) FROM THE SITE OF THE FUTURE DAM LAKE OF THE IRON GATES OF THE DANUBE, (IN RUMANIAN),**  
S. Negru.

Trav Mus Hist Nat Grigore Antipa. 11, p 175-189, 1971. English summary.

Identifiers: \*Coleoptera, Dam, \*Danube, Host, Iron-Gates, Lake, Plant, \*Scolytidae, Site.

Data are presented on 37 spp. (and 4 forms) of Scolytidae that were found for first time within the Iron Gates area and on 2 spp. already mentioned in the literature and now found again in the same zone. Some of these species are of great economic interest as harmful insects. Other data are given on the host-plants on which were found the mentioned Scolytidae. A table of the host-plants with the respective species of Scolytidae is given.—Copyright 1972, Biological Abstracts, Inc. W73-08284

**REVIEW OF STUDIES ON FEEDING OF AQUATIC INVERTEBRATES CONDUCTED AT THE INSTITUTE OF BIOLOGY OF INLAND WATERS, ACADEMY OF SCIENCE, USSR,**  
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.

A. V. Monakov. J. Fish Res Board Can. Vol 29, No 4, p 363-383, 1972. Illus.

Identifiers: \*Aquatic animals, \*Food habits, Biology, Chironomidae, Cladocera, Copepoda, Feeding, \*Invertebrates, Molluscs, Oligochaeta, Rotifera, \*Reviews.

The main results obtained at the Borok Institute during the last decade are reviewed. Food and methods of feeding by various aquatic invertebrates (Rotatoria, Oligochaeta, Mollusca, Cladocera, Copepoda, Chironomidae larvae), daily food consumption and assimilation of food were investigated. Most invertebrates are omnivores although some species live on only one type of food. Daily food consumption changes with food concentration, temperature, and size of consumer. At 15-22°C and a concentration of food close to optimum, mean daily rations of most invertebrates studied usually range from 25-100% of body weight. Only in pulmonate Gastropoda and silt-eating Tubificidae does it greatly exceed body weight. In rare cases, at very high concentration of food unusual in nature, the so-called 'extra feeding' may take place under experimental conditions. For most invertebrates feeding on natural food at optimum concentrations, index of assimilation varies widely, but rarely exceeds 50%. The assimilability of plant food was 45-55% in the majority of investigated species and appears to be considerably higher when animal food is used.—Copyright 1973, Biological Abstract, Inc. W73-08325

**SILVER-FOIL PSYCHROMETER FOR MEASURING LEAF WATER POTENTIAL IN SITU,**  
Agricultural Research Service, Riverside, Calif. Salinity Lab.

G. J. Hoffman, and S. L. Rawlins. Science (Wash.). Vol 177, No 4051, p 802-804. 1972. Illus.

Identifiers: \*Hygrometry, \*Instrumentation, Leaves, Measurement, Water potential, Psychrometers (Silver-foil), Temperature.

The water potential of leaves in situ was measured without temperature control with a miniature, single-junction psychrometer constructed from silver foil and attached to the leaf with a silver-impregnated, conductive coating. The temperature of the psychrometer stayed within 0.025°C of the temperature of a simulated leaf when the latter temperature was changing at a rate of 1°C/min. Leaf water potentials were measured with a precision of plus or minus 1 bar.—Copyright 1973, Biological Abstracts, Inc. W73-08332

**EFFECT OF DRY SEASON DROUGHT ON UPTAKE OF RADIOACTIVE PHOSPHORUS BY SURFACE ROOTS OF THE OIL PALM (ELAEIS GUINEENSIS JACQ.),**  
University of the West Indies, St. Augustine (Trinidad).

S. C. M. Forde. Agron J. Vol 64, No 5, p 622-623. 1972.

Identifiers: Dieback, \*Droughts, Elaeis guineensis, Moisture, \*Oil Palm, \*Phosphorus, Radioactive Roots, Seasons, Soils, Surface, \*Nigeria.

The hypothesis that the feeding roots of the oil palm die back because of the effects of pronounced dry season drought in Nigeria was tested using radioactive 32P as a tracer to study P uptake as influenced by different levels of soil moisture. Two trials were carried out in 1964 and 1965, respectively, with 3 treatments: (A) no irrigation during the dry season and 32P applied in solution to the soil; (B) 1 irrigation of 50.8 mm of

water shortly before application of 32P; and (C) irrigation at the rate of 50.8 mm of water/palm/wk throughout the dry season and 32P applied to the soil. Leaf samples were taken and the activity of 32P was determined. In both trials the uptake of 32P in treatment C was significantly higher than either treatment A or B and supported the hypothesis that the lower activity was caused by the dieback of the absorbing roots during the dry season drought.—Copyright 1973, Biological Abstracts, Inc. W73-08334

**STUDIES ON THE FISHERY AND BIOLOGY OF A FRESHWATER TELEOST, RITA RITA: V. MATURITY AND SPAWNING,**

K. N. Government Degree Coll., Gyanpur (India). Dept. of Zoology.

Maya Shanker Lal. Indian J Zootomy, Vol 11, No 1, p 41-52, 1970, Illus.

Identifiers: Biology, Fishery, \*Maturity (Fish), Rita-Rita, \*Spawning, \*Teleost.

Seven maturity stages were differentiated on the basis of the macroscopic observations and the range of the ova diameters. The seasonal progression of size frequency distribution of ova indicates that the fish spawns once a year only and the spawning season is short and restricted, extending from June to Aug. The lengths of the testis and ovary were plotted against the total length. A straight line relationship was found.—Copyright 1972, Biological Abstracts, Inc. W73-08343

**POSSIBILITY OF UTILIZING ATMOSPHERIC CONDENSATE IN THE HIGHER PLANT SYSTEM,**

N. T. Nilovskaya, S. V. Chizhov, Y. E. Sinyak, N. N. Shekhtovska, and M. I. Egorova. Kosm Biol Med, Vol 5, No 6, p 82-84, 1971. Illus.

Identifiers: \*Water conservation, \*Atmospheric condensate, \*Chinese cabbage, Plants.

Regenerating the moisture from atmosphere in a closed air system and utilization of this moisture in a higher plant (chinese cabbage) system are discussed. An absorption method was used, and the study showed that the inhibiting effect of unpurified atmosphere is thus removed.—Copyright 1973, Biological Abstracts, Inc. W73-08345

**AN ECOLOGICAL STUDY ON THE PROCESS OF PLANT COMMUNITY FORMATION IN TIDAL LAND, (IN KOREAN), C. S. KIM.**  
Mokpo Teachers' Coll. (South Korea).

For primary bibliographic entry see Field 02L. W73-08403

**OBSERVATIONS ON THE ECOLOGY OF ASSTRAGALUS TENNESSEENSIS,**

Kentucky Univ., Lexington. Dept. of Botany. C. C. Baskin, J. M. Baskin, and E. Quarterman. Am Midland Nat. Vol 88, No 1, p 167-182, 1972.

Identifiers: \*Astragalus-Tennesseensis, Cedar glades, Ecology, Glades, Habitat, Morphology, \*Legumes, \*Tennessee.

A. tennesseensis Gray, a decumbent, perennial legume, is endemic to the cedar glades of northern Alabama and central Tennessee. The present center of distribution is in central Tennessee, and only one population is known in northern Alabama. Its geographical range once extended to north-central Illinois and west-central Indiana, but within the past few decades it apparently has disappeared from these areas. Within the cedar glades of central Tennessee, the species grows mostly in the transition zone between the open glades and glade thickets or woods. Environmental conditions in this zone with respect to light, temperature, and

soil and atmospheric moisture are intermediate between those of open glade and glade woods. Seeds germinate in early spring, and the seedlings grow slowly, taking several years to reach reproductive maturity. Very few of the seedlings survive to adulthood. Flowering occurs from mid-April to mid-May, and cross-pollination is necessary for seed set. Fruits and seeds are mature by early June, fruits fall from plants by mid-July, and seeds are shed throughout the next year. Plants remain vegetative (nondormant) throughout the summer, shed their leaves in early autumn, after which vegetative buds at the caudex produce an overwintering rosette of leaves. Flower buds are initiated the following April, and meiosis and pollen grain formation occur as the buds begin to swell. Observations made over the past 6 yr in the middle Tennessee cedar glades suggest that the species is declining due to habitat disturbance and destruction by man. As destruction of its cedar glade habitat continues, the species, no doubt, will continue to decline and may even become extinct. —Copyright 1973, Biological Abstracts, Inc. W73-08405

#### COMPOSITION OF FISH POPULATIONS ON THE JARUGA RIVER, (M SERBO-CROATIAN), Sarajevo Univ. (Yugoslavia). Biolski Institut. M. Aganovic.

Ichthyology (Sarajevo) Vol 1, No 1, p 3-10, 1969. Illus. English summary.

Identifiers: \*Aulopype-Hiigelii, Chondrostoma-phoxinus, \*Fish population, \*Jaruga River, Leuciscus-Turskyi, Paraphoxinus-Alepidotus, Rivers, Scardinius-Erythrophthalmus, \*Yugoslavia.

The fish population estimates in the Jaruga river, Yugoslavia, arranged in decreasing abundance are as follows: Chondrostoma phoxinus (57.96%), Aulopype hiigelii (28.2%), Paraphoxinus alepidotus (9.68%), Leuciscus turskyi (4.4%) and Scardinius erythrophthalmus (3.75%). —Copyright 1972, Biological Abstracts, Inc. W73-08407

#### SOME FACTORS AFFECTING GERMINATION OF SWAMP TUPELO SEEDS, Forest Service (USDA), Charleston, D.C. Southeastern Forest Experiment Station.

A. W. Naylor.

Ecology, Vol 53, No 3, p 504-506, 1972.

Identifiers: \*Germination, Nyssa-Sylvatica-Var. Biflora, Regime, \*Seeds, Soil \*Swamp tupelo seeds, Water treatment.

The effects of 3 temperature levels (15 deg, 21 deg, and 33 deg C) in combination with 4 soil-water regimes (moist-drained, surface-saturated, flooded-stagnant, and flooded-aerated) on the germination of seeds of swamp tupelo (*Nyssa sylvatica* var. *biflora* (Walt.) Sarg.) were investigated. Germination was rapid in the moist-drained regime at temperatures of 21 deg and above. No germination occurred in potted soil where water levels were at or above the soil surface, regardless of temperature or whether the water was aerated. However, seeds germinated under water in the absence of soil, and aeration and partial removal of the seedcoat enhanced germination and early growth of the radicle. Seeds that had been submerged in flooded soil for up to 5 wk germinated when placed in moist sand, but the germination response of such seeds was substantially reduced at 33 deg C. —Copyright 1973, Biological Abstracts, Inc. W73-08417

#### IN SITU MEASUREMENT OF ROOT-WATER POTENTIAL, Duke Univ., Durham, N.C. Dept. of Botany. E. L. Fiscus.

Plant Physiol. Vol 50, No 1, p 191-193, 1972. Illus. Identifiers: \*Root-water potential, Tests, \*Zea-Mays, Roots, In-situ measurement.

A psychrometric technique was developed for measuring the water potential of attached growing roots of *Zea mays*. A measure of the root-water potential as well as of the potential in the adjacent soil reflects the ability of the plants to extract water from soils of varying potentials and provides information regarding the limits of this ability. This should be useful in determining the ability of plants to extract water from soils of varying potentials, and the magnitude of the root resistance to water flow. —Copyright 1973, Biological Abstracts, Inc. W73-08418

#### EFFECTS OF ABSCISIC ACID AND ITS ESTERS ON STOMATAL APERTURE AND THE TRANSPIRATION RATIO,

King's Coll., London (England). Dept of Botany. R. J. Jones, and T. A. Mansfield.

Physiol Plant. Vol 26, No 3, p 321-327, 1972. Illus. Identifiers: \*Abscisic-acid, Carbon, Esters, Oxides, \*Stomatal aperture, \*Transpiration ratio, Xanthium-strumarium.

A single surface application of abscisic acid or its methyl and phenyl esters suppressed stomatal opening on leaves of *Xanthium strumarium*. The effect was restricted to the treated parts of the leaf blades, there being no detectable translocation to untreated parts. There were no increases in CO<sub>2</sub> compensation to which stomatal closure could be attributed. Abscisic acid and its esters acted successfully as antitranspirants when applied one to leaf surfaces of young barley plants. Over a 9-day period there was a reduction of about 50% in the amount of H<sub>2</sub>O transpired without any detectable reduction in the rate of dry weight increase. The treatments reduced transpiration relatively more than dry matter accumulation, and hence there was an increase in the water use efficiency. The effect of the treatments became progressively less over 9 days, but even at the end of the experiment (day 9) both the esters reduced transpiration by 20-25%. The esters were slightly more effective than abscisic acid itself. Field trials of the anti-transpirant properties of these compounds were recommended. —Copyright 1973, Biological Abstracts, Inc. W73-08420

#### SOME WATER RELATIONS OF CERCOSPORA HERPOTRICHOIDES, Washington State Univ., Pullman. Dept. of Plant Pathology.

For primary bibliographic entry see Field 03F. W73-08421

#### ECOLOGICAL SIGNIFICANCE OF VEGETATION TO NORTHERN PIKE, ESOX LUCIUS, SPAWNING, Nebraska Game and Parks Commission, Lincoln. D. B. McCarrher, and R. E. Thomas.

Trans Am Fish Soc. Vol 101, No 3, p 560-563. 1972.

Identifiers: Ecological studies, *Esox-Lucius*, \*Pike, \*Spawning, Vegetation.

The importance of aquatic vegetation on the growth, survival and reproduction of pike is discussed. —Copyright 1973, Biological Abstracts, Inc. W73-08435

#### THREATENED FRESHWATER FISHES OF THE UNITED STATES, Michigan Univ., Ann Arbor. Museum of Zoology. R. R. Miller.

Trans Am Fish Soc. Vol 101, No 2, p 239-252. 1972.

Identifiers: \*Fishes, Freshwater fish, Legislation, Protective regulations, Threatened fish species.

Threatened, native freshwater fishes are listed for 49 of the 50 states, the first such compilation. Over

300 kinds are included in a formal classification, cross-indexed to states, followed by state lists and the status of each fish, whether rare, endangered, depleted, or undetermined. The concern for native fishes and the important factors responsible for threats to their existence are briefly outlined. Although the lists vary from those based on extensive recent state surveys to others in which current information is sparse, publication is expected to enhance the chances for survival through protective legislation (already enacted by a number of states) and stronger concern for such natural resources. —Copyright 1973, Biological Abstracts, Inc. W73-08439

#### TISSUE WATER POTENTIAL, <sup>14C</sup>-LABELED PHOTOSYNTHESIS, PHOTOSYNTHETIC UTILIZATION, AND GROWTH IN THE DESERT SHRUB LARREA DIVARICATA CAV, McGill Univ., Montreal (Quebec). Dept. of Biology.

W. C. Oechel, B. R. Strain, and W. R. Odening. Ecol Monogr. Vol 42, No 2, p 127-141. 1972. Illus. Identifiers: Adaptations, Carbon-14, Deserts, Growth, *Larrea-Divaricata*, \*Photosynthesis utilization, \*Photosynthesis, Shrubs, \*Water potential.

Tissue water potential is the most important factor throughout the seasons controlling phenological events, photosynthesis, and productivity of *L. divaricata* growing in Deep Canyon near Palm Desert, California. Growth of reproduction structures was initiated at the time of highest tissue water potential and ceased as water potential decreased. Percentage foliation correlated strongly with drawn water potential ( $r = 0.89$ ). The elongation rate of stems and the rate of node production were both dependent on tissue water potential. Leaf growth and node growth proceeded at varying rates throughout the year, providing a continuous sink for photosynthates. Photosynthetic rates ranged from 9.02 mg CO<sub>2</sub> incorporated/day/g dry weight of leaf tissue in Sept. to an estimated 74.7 mg CO<sub>2</sub> in early Feb. Net photosynthesis and relative productivity correlated very strongly with drawn water potential ( $r = 0.93$  and  $r = 0.97$ , respectively). *Larrea* plants were labeled at 1- to 2-mo intervals with photosynthetically incorporated <sup>14</sup>CO<sub>2</sub> to determine the utilization in growth and storage of photosynthate fractions produced at various times throughout the year. Tissue was subsampled at similar intervals, and the activity in various metabolic compounds (sugar, starch, lipid, organic acid, amino acid, protein, cellulose, and cell-water materials) was analyzed. The utilization of photosynthates in the various fractions was similar in all seasons. No appreciable mobilization into and out of storage materials was apparent. Never dormant, *Larrea* remains metabolically active and forms new tissue throughout the year. This growth pattern may be an important adaptation allowing *Larrea* to exist in a wide range of geographical and climatic areas, and perhaps owing to the species' tropical affinities, it might have been a preadaptation to the desert environment. —Copyright 1973, Biological Abstracts, Inc. W73-08444

#### 2J. Erosion and Sedimentation

##### INDICATION OF ROCKS BY DRAINAGE PATTERNS, Moskovskoye Obschestvo Ispytatelei Prirody (USSR). Geographic Div.

N. A. Gvozdetski, and I. P. Chalaya. In: Landscape Indicators—New Techniques in Geology and Geography: Consultants Bureau, Div of Plenum Press, London and New York, p 106-112, 1973. 5 fig, 1 ref. (Translated from Russian, Proceedings of Conference of Moscow Society of

## Field 02—WATER CYCLE

### Group 2J—Erosion and Sedimentation

Naturalists, May 21-22, 1968, Moscow, Nauka Press.

Descriptors: \*Terrain analysis, \*Geomorphology, \*Drainage patterns (Geologic), Erosion, Topography, Valleys, Karst, Aerial photography, Remote sensing.

Identifiers: \*USSR.

Peculiarities of a valley network in limestones and dolomites, together with general character of dissection, nature of steep slopes, and karst forms may represent a reliable interpretive feature even where exposures are poor and forests are common (as on the Naker'skiy karst-modified plateau in the western transcaucasian region of the USSR). Interpretation of air photos of many parts of the Tien Shan shows that different rock complexes, differing in origin and in physicochemical and petrographic properties, exhibit correspondence to specific drainage patterns and valley networks. The following groups of rocks may be distinguished: (1) Proterozoic and Paleozoic magmatic rocks, (2) Proterozoic and Paleozoic noncarbonate sedimentary and metamorphic rocks, with some inclusion of volcanic sequences, (3) Proterozoic and Paleozoic carbonate sedimentary and metamorphic rocks, (4) Mesozoic-Cenozoic noncarbonate sedimentary rocks, (5) Mesozoic-Cenozoic carbonate sedimentary rocks. Usually, regions composed of rocks belonging to any one of these groups exhibit distinctive relief with specific forms of erosional dissection. From the drainage pattern and structural features of the relief, it is possible to determine the distribution of particular rock complexes. (Knapp-USGS) W73-07846

#### THE USE OF DRAINAGE PATTERNS FOR INTERPRETING THE MORPHOSTRUCTURES OF THE MOSCOW DISTRICT, Moskovskoe Obshchestvo Ispytatelei Prirody (USSR). Geographic Div.

N. P. Matveev.

In: Landscape Indicators—New Techniques in Geology and Geography: Consultants Bureau, Div of Plenum Press, London and New York, p 113-117, 1973. 5 ref. (Translated from Russian. Proceedings of Conference of Moscow Society of Naturalists, May 21-22, 1968, Moscow, Nauka Press).

Descriptors: \*Terrain analysis, \*Structural geology, \*Geomorphology, \*Profiles, \*Degradation (Stream), Stream erosion, Erosion, Sedimentation, Geologic control, Mapping, Hydrogeology, Drainage patterns (Geologic).

Identifiers: \*USSR, \*Moscow.

The drainage pattern is very sensitive to different physiogeographic factors, especially to tectonic deformation and to lithology of a region. Tectonics and lithology affect not only the drainage pattern but also the longitudinal profile of the streams. The relations in the Moscow region are used to show the relationship between longitudinal profiles of streams and structure and to consider the possible interpretation of morphostructures from such longitudinal profiles. Recent tectonic deformation embracing a small area apparently does not substantially affect the stream profile. When the profile is near equilibrium downcutting is absent, and tectonic deformation may change the profile. (Knapp-USGS) W73-07847

#### TRANSIENT AND STEADY-STATE SALT TRANSPORT BETWEEN SEDIMENTS AND BRINE IN CLOSED LAKES, Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.

For primary bibliographic entry see Field 02H.

W73-07850

PH BUFFERING OF PORE WATER OF RECENT ANOXIC MARINE SEDIMENTS, California Univ., Los Angeles. Dept. of Geology. For primary bibliographic entry see Field 05B. W73-07851

#### EXAMINATION OF TEXTURES AND STRUCTURES MUD IN LAYERED SEDIMENTS AT THE ENTRANCE OF A GEORGIA TIDAL INLET, Skidaway Inst. of Oceanography, Savannah, Ga. G. F. Oertel.

Journal of Sedimentary Petrology, Vol 43, No 1, p 33-41, March 1973. 9 fig, 19 ref.

Descriptors: \*Deltas, \*Sedimentary structures, \*Beds (Stratigraphic), \*Deposition (Sediments), Sedimentation, Ripple marks, Stratigraphy, Clays, Silts, Sands, Bed load, Suspended load, \*Georgia.

Identifiers: Doboy Sound (Ga).

Mud layers at the entrance of a Georgia tidal inlet are of three texturally and structurally different types. Type I mud layers are composed of laminations of clay-size detritus that occur as flaser, wavy and lenticular bedding. Type II mud layers are composed of foresets and sand-size fecal and organic detritus that also occur as flaser, wavy and lenticular bedding. Type III mud layers are composed of foresets of mud pebbles and occur as wavy lenticular bedding. The types of layers form in response to hydraulically different depositional processes combined with local variation of availability of mud-grain sizes. Grains which constitute mud layers are transported and deposited from the bed load as well as the suspension load. In some areas, deposition from the bedload is considerably more pronounced than deposition from suspension load. Type II and III mud layers result from bedload deposition which does not necessitate a period of slack-water in the tidal cycle or a specific set of conditions of wave activity, suspended-matter concentration, and current velocity. (Knapp-USGS) W73-07855

#### ASPECTS OF SEDIMENTATION AND DEVELOPMENT OF A CARBONATE BANK IN THE BARRACUDA KEYS, SOUTH FLORIDA, Georgia Univ., Athens. Dept. of Geology.

P. B. Basan.

Journal of Sedimentary Petrology, Vol 43, No 1, p 42-53, March 1973. 5 fig, 30 ref.

Descriptors: \*Sedimentation, \*Carbonate rocks, \*Florida, \*Tidal waters, Geologic control, Reefs, Sediment transport, Deposition (Sediments), Currents (Water), Tides, Tidal streams, Tidal marshes, Intertidal areas, Waves (Water).

Identifiers: \*Carbonate banks, \*Barracuda Keys (Fla).

A carbonate bank in the Barracuda Keys, Florida, was studied to find the factors influencing its growth and configuration. Hydrodynamically or biologically controlled sedimentary subenvironments were distinguished: tidal channels, unstable banks, stable banks (including bare-sand, Thalassia, and mangrove island) and silty lagoons. The bank is a closed system wherein local biological production of sediment is in equilibrium with physical dispersal of sediment. Sediment is generally of uniform size, and responds to current flow more as unit 'sheets' than as individual particles, thereby permitting a maximum amount of sediment transport. The major constructional process is the flood tide current, which transports sediment by traction, saltation, and to a lesser extent, suspension and flotation. Development of this bank may be summarized as follows: preferential accumulation of fine sediment in sink holes, forming coalescing silty banks; contemporaneous colonization of these banks by calcareous algae and marine grasses; entrapment and accumulation of coarse sediment by these marine

plants, forming a single, contiguous sand bank; and continued growth by accretion of sediment over avalanche slopes. The bank is probably extending itself into the adjoining lagoon by a process of differential growth. This process is dependent upon stabilization of one part of the bank, while growth continues in another. (Knapp-USGS) W73-07856

#### CARBON ISOTOPE COMPOSITION OF DIAGENETIC CARBONATE NODULES FROM FRESHWATER SWAMP SEDIMENTS, Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

T. Whelan, III, and H. H. Roberts.

Journal of Sedimentary Petrology, Vol 43, No 1, p 54-58, March 1973. 3 fig, 11 ref. NR 388 002, ONR Contract N00014-69-A-0211-0003.

Descriptors: \*Diagenesis, \*Carbonates, \*Stable isotopes, \*Swamps, Water chemistry, Carbonate rocks, Limestones, Carbon, Sedimentation, Bicarbonates, Water circulation, Geochemistry, Sedimentation rates, Louisiana, Mississippi River basin.

Identifiers: Carbon isotopes.

The carbon isotope composition of freshwater diagenetic carbonate nodules ranges from -0.95‰ (vs. NBS 20) in well-drained environments to -1.91‰ in poorly-drained environments of a freshwater swamp. The C-13 values of carbonate nodules are not a function of depth of burial. Depositional environment determines the isotope composition. Data from two cores taken in different sedimentary sequences suggest that in poorly drained sections transformations of isotopically light organic matter yield carbon, which is incorporated into the diagenetic carbonate. In well-drained sections, renewal of freshwater, in which carbon species are dissolved, provides the source of carbon for diagenetic carbonate nodules. (Knapp-USGS) W73-07857

#### THE ST. CLAIR RIVER DELTA: SEDIMENTARY CHARACTERISTICS AND DEPOSITIONAL ENVIRONMENTS, Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.

J. M. Pezzetta.

Journal of Sedimentary Petrology, Vol 43, No 1, p 168-187, March 1973. 8 fig, 3 tab, 61 ref.

Descriptors: \*Sedimentation, \*Lakes, \*Deltas, Deposition (Sediments), \*Michigan, Stratigraphy, Statistics, Particle size, Sediment transport, Distribution patterns, Waves (Water), Currents (Water), Silts, Sands, Clays.

Identifiers: \*Lake St. Clair (Mich).

Progradation of the northeastern shoreline of Lake St. Clair by the St. Clair River has created a modern, freshwater delta with a birdfoot configuration. The recent sediments are moderately sorted very fine sand to very coarse silt with a mean grain size of 3.35 phi. Grain-size frequency distributions are slightly asymmetric and moderately leptokurtic. Coarser textured and somewhat poorly sorted sediments are associated with the occurrence of higher current and wind speeds. Winnowing action by currents may not be as dominant as the introduction of coarser fractions into finer grained sedimentary environments. Primary distributive processes are wind-driven currents and wave action along the delta front where the finer components are dispersed to the west and south. The depositional environments of the lake are: the open lake and interdistributary troughs where high energy processes are dominant; the interdistributary bay margins including the levees, backswamps and marshes; shallow areas of sparse aquatic vegetation and medium energy sedimentary processes; low energy environments with thick overgrowths of aquatic

vegetation, particularly near the headward parts of the interdistributary bays; and the deep lake basin beyond the delta front. (Knapp-USGS)  
W73-07858

**SURF ZONE SHAPE CHANGES IN QUARTZ GRAINS ON POCKET BEACHES, CAPE ARAGO, OREGON.**  
Oregon Univ., Eugene. Dept. of Geology.  
C. J. F. Rottman.  
Journal of Sedimentary Petrology, Vol 43, No 1, p 188-199, March 1973. 6 fig, 8 tab, 23 ref.

Descriptors: \*Sands, \*Beaches, \*Particle shape, \*Erosion, Provenance, Quartz, Particle size, Surf, Waves (Water), Statistics, \*Oregon, Mineralogy. Identifiers: \*Cape Arago (Ore).

Juxtaposition of modern pocket beach sands, Pleistocene terrace sands, and Eocene sandstones at Cape Arago, Oregon, provides a natural setting for studying changes in grain shape as produced by surf action. Differences between shape parameters of quartz grains from the older sandstones and those from the more recently deposited sediments may be attributed to the effects of surf action. Mean roundness and mean sphericity were measured on a total of 13,153 quartz grains collected from three separate pocket beaches, the Pleistocene sands, and the Eocene sandstones. Principal components analysis was applied to shape data and supplementary size and heavy mineral data. Trends revealed by this analysis show that the sands of one pocket beach are sufficiently similar to those of the bedrock to indicate a definite genetic relationship. Statistical comparison tests of average mean roundness values for quartz grains from the Coaledo bedrock and those from Beach One indicate that the beach grains have undergone a statistically significant increase in roundness. However, there is no significant change in mean sphericity. (Knapp-USGS)  
W73-07859

**A WAVE TANK ANALYSIS OF THE BEACH FORESHORE GRAIN SIZE DISTRIBUTION,**  
Tulsa Univ., Okla. Dept. of Earth Sciences.  
J. R. Kolmer.  
Journal of Sedimentary Petrology, Vol 43, No 1, p 200-204, March 1973. 8 fig, 5 ref.

Descriptors: \*Beaches, \*Surf, \*Sediment sorting, \*Particle size, \*Saltation, Sediment transport, Sands, Hydraulic models, Waves (Water), Distribution patterns, Sampling, Bed load.

Laboratory and field studies were conducted to evaluate metal adsorptive capacities of six soils. These and stability constants of soil-metal complexes were used to understand the ability of the soils to complex trace metals, and to explain the leachability or retention of toxic metals by certain soils. Maximum adsorption capacities, relative amounts of metal complexed with one mole of soil, and stability constants ( $\log K$  values) were calculated from adsorption data of cations retained by soils. The soil-metal adsorption patterns obtained were similar to the Langmuir-Fruehlich adsorption isotherms. Adsorption studies indicated that soil complexes metals and renders them insoluble regardless of genesis, organic matter content, and their physicochemical properties. Readiness to complex, however, depends on these properties and the nature of the metal rendered insoluble. Multivalent and divalent and the more electronegative cations make relatively more stable complexes, particularly with soils high in organic matter. Mechanisms mainly responsible for rendering the metals insoluble were considered to be chelation, surface adsorption, precipitation, and diffusion and physical entrapment. Spectral studies were used to investigate the structure of metal ligands and whether complex formation had occurred nondestructively. The laboratory models indicated that the soil has

maximum capacity to adsorb metals. However, under field conditions, there was no indication that the maximum capacity was reached. (Warman-Alabama)  
W73-07860

**A NOTE ON ASYMMETRICAL STRUCTURES CAUSED BY DIFFERENTIAL WIND EROSION OF A DAMP, SANDY FOREBEACH,**  
California State Univ., San Diego. Dept. of Geology.  
R. W. Berry.

Journal of Sedimentary Petrology, Vol 43, No 1, p 205-206, March 1973. 1 fig, 2 ref.

Descriptors: \*Sedimentary structures, \*Beaches, \*Wind erosion, Sands, Beach erosion, Winds, \*Mexico. Identifiers: Differential erosion, \*Baja California.

Asymmetrical structures 5 to 10 mm high, 10 to 20 mm long, and 5 to 10 mm wide on a damp, sandy beach at Bahia de los Frailes, Territory of Baja California, Mexico were formed as a result of differential erosion by wind. They were elongated parallel to the wind with the steep slopes of each structure facing into the wind. Nonuniform compaction of sand grains along the beach is suggested as a fundamental reason for the development of the structures. (Knapp-USGS)  
W73-07861

**ZONE OF INFLUENCE — INNER CONTINENTAL SHELF OF GEORGIA,**  
Georgia Inst. of Tech., Atlanta.  
G. N. Bigham.

Journal of Sedimentary Petrology, Vol 43, No 1, p 207-214, March 1973. 5 fig, 16 ref.

Descriptors: \*Sediment transport, \*Clays, \*Continental shelf, \*Ocean currents, \*Clay minerals, \*Georgia, Littoral drift, Bottom sediments, Settling velocity, Distribution patterns, Mineralogy, Suspended load, Sedimentation, Coastal plains, Atlantic Coastal Plain.

Sediment transport was studied on the inner continental shelf of Georgia. Ninety-three suspended-matter samples were collected from 52 stations during the summer of 1970. Bottom sediment, near-surface samples, and near-bottom suspended-matter samples were taken. Salinity, temperature, and current direction and velocity measurements were also made to determine the nature of shelf-sediment transport processes. Sediments and suspended matter were analyzed by x-ray diffraction. Georgia rivers contribute kaolinite, smectite, and illite to the coastal region, while a kaolinite-illite clay mineral suite is transported southward by longshore drift so that net transport direction may be inferred by suspended-matter clay mineralogy patterns. The shelf-water circulation pattern during the summer months is a complex system of tidal-current and wind-generated eddies superimposed on a predominantly southward drift. Differential settling characteristics explain the suspended clay mineral distribution and establish a zone of influence which extends 3 to 10 miles offshore. This zone is the maximum seaward extent of present-day river-derived suspended detritus. Particulate and dissolved pollutants are probably restricted to the zone of influence, and are not contributed to the Florida current. (Knapp-USGS)  
W73-07862

**SURFACE SEDIMENTS OF THE GULF OF PANAMA,**  
Woods Hole Oceanographic Institution, Mass.  
J. C. MacLain, and D. A. Ross.

Journal of Sedimentary Petrology, Vol 43, No 1, p 215-223, March 1973. 8 fig, 2 tab, 12 ref. ONR Contract CO-N-00014-66-0241.

Descriptors: \*Bottom sediments, \*Continental shelf, \*Pacific Ocean, \*Provenance, \*Distribution patterns, Sediment transport, Sedimentation, Ocean currents, Ocean circulation, Clays, Mineralogy, Silts, Sands, Sedimentology. Identifiers: \*Gulf of Panama.

The surface sediments of the Gulf of Panama consist of a relict sand covering the central and outer portion of the shelf, and nearshore recent fine-grained sediments with local accumulations of coarser sediments. Clays, with occasional patches of rocks and pebbles, are typical of the continental slope. Deposition of sand in the central portion of the Gulf was controlled primarily by the topography of the exposed shelf during the last low stand of sea level. During this time streams distributed sediment from the east and west towards the center of the Gulf. During part of the Pleistocene, the main drainage entering the Gulf through San Miguel Bay passed north of the Archipielago de Las Perlas and across the shelf in the prominent central submarine valley. Presently fine-grained sediments are being transported and deposited in a counter-clockwise direction around the inner part of the Gulf, producing a deposit which is nearly homogeneous in mineralogy. Fine-grained sediment is forming a prism moving out from the shore towards the center of the Gulf; some has bypassed the shelf and is being deposited on the slope. Heavy mineral determinations were made by conventional optical and x-ray techniques. Distribution patterns derived using x-ray peak heights and a Q-mode factor analysis on data from both techniques were compared and showed very good similarity. (Knapp-USGS)  
W73-07863

**CONTINENTAL-SHELF SEDIMENTS OFF NEW JERSEY,**  
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Geology.  
G. M. Friedman.

Journal of Sedimentary Petrology, Vol 43, No 1, p 224-237, March 1973. 9 fig, 1 tab, 59 ref.

Descriptors: \*Atlantic Coastal Plain, \*Continental shelf, \*New Jersey, \*Bottom sediments, \*Mineralogy, Provenance, Sedimentation, Sedimentology, Sediment transport, Quaternary period, Stratigraphy.

Surface sediment samples from a study area 20 miles wide across the New Jersey continental shelf north of Atlantic City were studied. The sediment consists mostly of moderately well-sorted, medium-grained sand with a remarkable absence of particles finer than 125 microns in size. This absence of fine particles is related to the reworking during the Holocene transgression. Mapping of statistical parameters suggests that during the Holocene submergence stillstands occurred at about 40 and 20 fathoms. Morphologic terraces at about 80 and 68 fathoms may be distinguished. The abundance of hornblende and garnet and the presence of magnetite in the shelf samples contrasts with the absence of these minerals in Cretaceous, Miocene or Quaternary rocks on the adjacent coastal plain. It is suggested that the continental-shelf sediments may have been derived from an ancestral Hudson River. (Knapp-USGS)  
W73-07864

**TEXTURAL CHANGES AS AN INDICATOR OF SEDIMENT DISPERSION IN THE NORTHERN CHANNEL ISLAND PASSAGES, CALIFORNIA,**  
University of Southern California, Los Angeles. Dept. of Geological Sciences.  
J. S. Booth.

Journal of Sedimentary Petrology, Vol 43, No 1, p 238-250, March 1973. 16 fig, 3 tab, 17 ref. ONR Contract N00014-67-A-0269-0009C.

Descriptors: \*Sediment transport, \*Dispersion, \*Distribution patterns, \*California, Tidal waters.

## Field 02—WATER CYCLE

### Group 2J—Erosion and Sedimentation

Currents (water), Statistics, Bottom sediments, Winds, Littoral drift, Tracers, Tracking techniques, Continental shelf.  
Identifiers: \*Channel Island (Calif).

A technique for determining sediment dispersion in shallow, high energy marine environments is based on changes in textural properties with changes in energy. In order to test this technique, samples were collected from the Northern Channel Island Passages off the southern California coast. The four textural moments were calculated for each sample and polynomial trend surface contour maps were constructed for mean and sorting for each passage. San Miguel Passage is characterized by sediment dispersion to the southeast. The energy level is highest in the center of the passage and there is a gradual decrease in energy toward the perimeter. Santa Cruz Channel is more complex. A lobe of coarse sediment, part of which appears to be relict, in the northern section of the channel shows dispersion to the east. However, finer sediment is moving into the southern part of the area from the east, where it is intercepted by the head of Santa Cruz Canyon. Because there is movement to the east and west, this channel may represent a shear zone between two currents. Anacapa Passage shows dominant westward dispersion along both the southern and northern margins, with the southern one being the most significant. Relict sediment appears to exist in this passage as well. Wind-driven currents are more important than either tidal currents or wave action in accounting for sediment distribution. (Knapp-USGS)  
W73-07865

ARGENTINE BASIN SEDIMENT SOURCES AS INDICATED BY QUARTZ SURFACE TEXTURES,  
Queens Coll., Flushing, N.Y. Dept. of Geology.  
D. Krinsley, P. E. Biscaye, and K. K. Turekian.  
Journal of Sedimentary Petrology, Vol 43, No 1, p 251-257, March 1973. 4 fig, 1 tab, 16 ref.

Descriptors: \*Provenance, \*Bottom sediments, \*Particle shape, \*Sands, \*Quartz, Stratigraphy, Sedimentation, Sedimentology, Mineralogy, Abrasion, Atlantic Ocean, Antarctic Ocean.  
Identifiers: \*Argentine Basin (Pacific Ocean).

Distinctive quartz surface textures, as determined by scanning electron microscopy, can be used to identify sources of sediment in the Argentine Basin. Glacial quartz from the south, fluvial-littoral quartz from the continental margin, and windblown hot-dune sand can be identified and their distributions tentatively assessed. (Knapp-USGS)  
W73-07866

ALKALINITY DETERMINATION IN INTERSTITIAL WATERS OF MARINE SEDIMENTS,  
Scripps Institution of Oceanography, La Jolla, Calif.  
J. M. Gieskes, and W. C. Rogers.  
Journal of Sedimentary Petrology, Vol 43, No 1, p 272-277, March 1973. 1 fig, 2 tab, 16 ref.

Descriptors: \*Alkalinity, \*Pore water, \*Connate water, \*Bottom sediments, Carbonates, Sulfides, Ammonia, Ion exchange, Calcium, Magnesium, Sulfates, Phosphates, Water chemistry, Hydrogen ion concentration, Diagenesis.

The titration alkalinity of interstitial water is defined in terms of the ionic species that contribute to the alkalinity. The significance and the magnitude of these contributions may be estimated from available analytical data. A method for the potentiometric titration of the alkalinity is described with special reference to the various techniques available for the evaluation of the equivalence point. The possible effect of the

sulfate content of the samples on the mathematical evaluation of the end point is discussed. The accuracy of the method is estimated to be 0.5%. (Knapp-USGS)  
W73-07867

CHANGES IN CLAY MINERAL ASSEMBLAGES BY SAMPLER TYPE,  
George Washington Univ., Washington, D.C.  
Dept. of Geology.  
F. R. Siegel, and J. W. Pierce.  
Journal of Sedimentary Petrology, Vol 43, No 1, p 287-290, March 1973. 3 tab, 9 ref. NSF Grant GA-16499.

Descriptors: \*Sampling, \*Bottom sediments, \*Clay minerals, \*Bottom sampling, Cores, Dredging, Heterogeneity, Reliability, Variability.

Clay mineral contents of samples of Recent marine sediments from the Golfo San Matias, Argentina, taken as piston cores, gravity cores, and grab samples, show values which differ according to the type of sampler used. Averages for the components of the clay mineral assemblages are similar for the piston core and grab sample groups, whereas those for the Phleger samples are significantly different. Comparisons of clay mineral distributions in Recent marine environments can be made with confidence only if the same type sampling device is used to extract all the bottom sediments. The data from grab and piston core samples may, however, be treated together. (Knapp-USGS)  
W73-07868

#### QUANTITATIVE GEOMORPHOLOGY—SOME ASPECTS AND APPLICATIONS.

Proceedings of 2nd Annual Geomorphology Symposium Series held at Binghamton, N.Y., Oct 15-16, 1971: Binghamton, State Univ of New York Publications in Geomorphology, M., Morisawa, editor, 1972. 315 p, 17 ref.

Descriptors: \*Geomorphology, \*Mathematical studies, \*Statistical methods, \*Statistics, Topography, Terrain analysis, Land forming, Erosion, Sedimentation, Hydrology, Sediment transport, Reviews.  
Identifiers: \*Quantitative geomorphology.

One of the most important trends in geomorphology in the past 25 years has been the orientation of the field toward more objective, mathematical methods of studying landforms and the processes which create them. This second Annual Geomorphology Symposium volume presents papers exemplifying the history, use and some problems of quantitative techniques in geomorphology. Papers in Part I deal with abstract concerns in geomorphic quantification. Part II illustrates the wide variety of geomorphic fields into which quantitative investigations have been carried since their inception. Geomorphic phenomena such as mass movements, glaciation, and shoreline changes have become areas for mathematical and statistical methodology. Part III includes four papers illustrating the practical applications of quantitative description and analysis of fluvial systems. Cumulative frequency curves of slope and relief were used in evaluating an area for suitability as a site for testing military trafficability, mobility and visibility. (Knapp-USGS)  
W73-07869

THREADS OF INQUIRY IN QUANTITATIVE GEOMORPHOLOGY,  
Iowa Univ., Iowa City. Dept. of Geography.  
N. E. Salisbury.

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposium Series, p 9-60, 1972. 3 tab, 398 ref.

Descriptors: \*Geomorphology, \*Mathematical studies, \*Statistical methods, \*Statistics, Topography, Terrain analysis, Land forming, Erosion, Sedimentation, Hydrology, Sediment transport, Reviews.  
Identifiers: \*Quantitative geomorphology.

Quantitative geomorphology involves description of land surface form, including empirical explanations of interrelationships between form elements. These descriptions include geometry of channels and valleys, stream profiles, development of drainage nets, topology, explanations of streamflow and systems of landscape explanation, including slope development. Much of the effort in geology can be traced to the impetus provided by Horton's 1945 paper on 'Erosional development of streams and their drainage basins.' Through time, geographers became more involved with fluvial processes, and by the late 1960's there was little to distinguish their work from that of geologists, save somewhat greater attention to spatial variables or generalizations. Quantitative techniques that were originally introduced largely in fluvial geomorphology with some opposition, are now widely accepted in all phases of geomorphology. (See also W73-07869) (Knapp-USGS)  
W73-07870

#### PROBLEMS OF INTERPRETATION OF SIMULATION MODELS OF GEOLGIC PROCESSES, Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

A. D. Howard.  
In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposium Series, p 62-82, 1972. 5 fig, 1 tab, 40 ref.

Descriptors: \*Mathematical models, \*Geomorphology, \*Simulation analysis, Model studies, Numerical analysis, Stochastic processes, Variability, Reviews.  
Identifiers: \*Quantitative geomorphology.

Mathematical models of geologic systems commonly can only give numerical predictions by using the technique of simulation. Simulation introduces additional assumptions, whose effects are minimized in the case of solution of differential equations by small spatio-temporal increments and in the case of probabilistic models by sufficient repetitions of the simulation to give accurate values of statistical parameters. In some cases models with very different assumptions about the nature of the processes involved give similar predictions due to the dominance in determining results by a seemingly less important assumption common to all the models. Relative importance of the various theoretical constructs of the model can generally be determined only by noting effects of modification of the hypotheses upon the outcome. Nearly identical predictions are sometimes made by competing models which have no apparent common theoretical constructs. Models differ in degree of generality of the various assumptions incorporated in the model; models give more satisfactory explanations of nature to the degree that they incorporate general laws such as those of mechanics instead of experimental, empirical, or ad hoc assumptions. Inherent randomness can never be proven or disproven; however, the scientist may show by constructing more accurate deterministic models the maximum limits of any proposed inherent randomness. (See also W73-07869) (Knapp-USGS)  
W73-07871

THE TWO DIMENSIONAL SPATIAL ORGANIZATION OF CLEAR CREEK AND OLD MAN CREEK, IOWA,  
Harvard Univ., Cambridge, Mass. Lab. for Computer Graphics and Spatial Analysis.  
M. Woldenberg.

## WATER CYCLE—Field 02

### Erosion and Sedimentation—Group 2J

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposia Series, p 83-106, 1972. 7 fig, 6 tab, 22 ref.

Descriptors: \*Geomorphology, \*River basins, \*Drainage patterns (geologic), Iowa, River systems, Drainage density, Topography, Terrain analysis, Horton's law.

Identifiers: \*Quantitative geomorphology.

The spatial organization of Clear Creek and Old Man Creek, adjacent 6th and 7th order eastward flowing tributaries of the Iowa River, was investigated at the 7th, 6th and 5th order levels. When the number of basins per order was compared to a model based on mixed hexagonal hierarchies of drainage basin areas, evidence was found for spatial complementarity, incomplete basins, and over-complete basins. It was possible to combine contiguous basins and interbasin areas to create equilibrium hierarchies. Both major basins are long and narrow. The main streams flow asymmetrically near the southern sides of each valley. The asymmetry allows the formation of more higher order streams than would be the case in a symmetrical basin. This, in turn, may allow the system to transport water and detritus with less frictional loss. (See also W73-07869) (Knapp-USGS)

W73-07872

#### A QUANTITATIVE GEOMORPHOLOGY FIELD COURSE, Arizona Univ., Tucson. Dept. of Geosciences.

W. B. Bull.

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposia Series, p 107-117, 1972. 1 fig, 1 tab, 9 ref.

Descriptors: \*Geomorphology, \*Education, On-site data collections, Universities, Terrain analysis, Topography, Mapping, On-site INVESTIGATIONS.

Identifiers: \*Quantitative geomorphology.

A graduate-level field-oriented course in geomorphology can stimulate students' curiosity about geomorphic processes and suggest ways in which geomorphology may be applied to practical problems. It is to the advantage of the class to have students with diverse interests, such as civil engineering, geography, geology, geological engineering, geophysics, hydrology, and watershed management, work together on common field problems. The quantitative geomorphology course at the University of Arizona consists chiefly of afternoon field trips, seminars, and literature discussion sessions. The field work is done by two-man to four-man teams that either study the morphology or devise simple instrumentation to measure magnitudes and rates of processes at a trip site. Teams exchange results of their work at a seminar during the next week, and the field trips are preceded by discussion of pertinent literature. Different types of field work can be rotated to each team for some trips. The infrequent periods of poor field weather are spent on topographic map analysis. Appropriate geomorphic field-study sites in southern Arizona include ephemeral stream channels, pediments, alluvial fans, stream terraces, playas, debris-flow channels, hillslopes, and Quaternary volcanic craters. Similar courses in humid regions might include perennial streams, landslides and earthflows, seacoasts, karst topography, estuaries and tidal flats, lakes and ponds, and periglacial areas. (See also W73-07869) (Knapp-USGS)

W73-07873

#### MASS-MOVEMENT STUDIES NEAR MADISON, WISCONSIN, Connecticut Univ., Storrs.

R. F. Black, and T. D. Hamilton.

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposia Series, p 121-179, 1972. 29 fig, 4 tab, 17 ref.

Descriptors: \*Mass wasting, \*Wisconsin, \*Geomorphology, \*Degradation (slope), \*Instrumentation, \*On-site data collections, On-site investigations, Measurement, Creep, Loess, Slopes.

Identifiers: \*Quantitative geomorphology.

Techniques and equipment for study of mass-movement processes were evaluated on slopes near Madison, Wisconsin. Special bench marks consisted of solid iron rods cemented vertically into bedrock and separated from the soil mantle by much larger diameter capped casings. Within fenced enclosures, point-gage measurements of small stones proved best for determining both horizontal and vertical movements. The point gages were used from permanently mounted steel and aluminum platforms cemented to bedrock. Dial indicators on special mounts on the same platforms measured displacements of small stones, and linear-motion transducers recorded movements continuously even under this snow. However, difficulties with the mounts from wind effects and friction from various causes in the mechanical linkages made those two systems unreliable without frequent attention. Strain gages in the soil failed before a year cycle was completed. Eighty blocks of dolomite 20 cm to 5 m across in a pasture with cattle were drilled and plugged with rods on which fine crosses were scratched. One 75-m line of 21 blocks on a slope of 4 deg to 25 deg lengthened 97.2 mm, with lengthening mostly confined to the steeper slope. At one fenced site, vertical displacement of five small stones on and in loessial soil on nearly level ground was up to 18 mm. Wetting and drying often were more important than freezing and thawing. Downslope motion of surface soil and small stones on steeper non-wooded slopes in the study area averages perhaps 5 mm each year. This equivalent to a vertical lowering of the surface of about 2 mm per year, or 200 cm per 1000 years. Gentle or wooded slopes and larger blocks of rock move much less. (See also W73-07869) (Knapp-USGS)

W73-07874

#### THE SURFICIAL FABRIC OF ROCKFALL TALUS, Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.

E. R. McSaveney.

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposia Series, p 181-197, 1972. 7 fig, 4 tab, 10 ref.

Descriptors: \*Talus, \*Geomorphology, \*Sedimentary structures, \*Petrofabrics, Degradation (slope), Mass wasting, Particle shape, Particle size, Numerical analysis, Mathematical models.

Identifiers: \*Quantitative geomorphology, \*Rockfall talus.

Rockfall talus in the Front Range, Colorado, has a distinct fabric. Three-dimensional analysis shows a subhorizontal girdle on which are superimposed several modes. The principal mode parallels slope direction but plunges less than the surface slope, indicating imbrication in an upslope direction. Transverse modes are at angles of 90 deg or less to the downslope mode. The girdle reflects the overall geometry of the talus surface, while the modes are produced by the motion of particles over the surface, with rolling and sliding playing equal roles. Fabric strength is a function of surface roughness, and decreases with increasing particle size downslope. Treatment of talus orientation data only by purely numerical methods, including two- and three-dimensional vector analyses and their associated tests of significance, obscures more than it clarifies. Use of these methods as the sole determinant of the presence or absence of

fabric should be avoided. (See also W73-07869) (Knapp-USGS)

W73-07875

#### COMPUTATIONAL METHODS FOR ANALYSIS OF BEACH AND WAVE DYNAMICS, Massachusetts Univ., Amherst. Dept. of Civil Engineering.

J. M. Colonell, and V. Goldsmith.

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposia Series, p 198-222, 1972. 15 fig, 15 ref. USCE Contract DACW 72-67-C-0004.

Descriptors: \*Geomorphology, \*Data processing, \*Beach erosion, \*Massachusetts, \*Surf, Littoral drift, Waves (water), Computer programs, Sedimentation, Sediment transport, Refraction (water waves), Profiles, Dunes, Sands, Numerical analysis.

Identifiers: \*Quantitative geomorphology.

Computer programs (including graphic displays of results) are available for storm wave forecasting, wave refraction, volumetric changes of beach profiles, and statistical analyses of grain size and internal dune geometry. The primary goal in these analyses is to relate observed changes in the intertidal portions of the beaches to processes active in the adjacent offshore areas. At twelve permanent beach profile locations on Monomoy Island and four on Nauset Spit, Cape Cod, Massachusetts, there are large variations in the amount of erosion and accretion occurring along the length of this 16-mile barrier island coastline. Analysis of the wave behavior in the adjacent offshore area with the aid of storm wave forecasting techniques and over 200 wave refraction diagrams yields a correlation between zones of wave energy concentration and zones of increased erosion. Beach sediments are essentially in equilibrium with the wave energy conditions as there is no decrease in grain size 'downdrift'. Instead, zones of wave energy concentrations are suggested by small areas of coarser-grained sediment observed at several locations along the beach. The coastal sand dunes have a distinctive internal geometry characterized by low dip angles and azimuths that correlate with prevailing wind directions rather than with storm winds. These conclusions are statistically valid at any dune elevation. (See also W73-07869) (Knapp-USGS)

W73-07876

#### QUANTITATIVE ANALYSIS OF THE FACTORS CONTROLLING THE DISTRIBUTION OF CORRIE GLACIERS IN OKOA BAY, EAST BAFFIN ISLAND (WITH PARTICULAR REFERENCE TO GLOBAL RADIATION), Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.

J. T. Andrews.

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposia Series, p 223-241, 1972. 8 fig, 2 tab, 19 ref.

Descriptors: \*Glaciers, \*Arctic, \*Cirques, \*Geomorphology, \*Glaciation, Canada, Climates, Statistical methods, Correlation analysis, Solar radiation, Pleistocene epoch, Weather.

Identifiers: \*Quantitative geomorphology.

Corrie glaciers near Okoa Bay, east Baffin Island, N.W.T., Canada were studied using quantitative methods. Indirect glaciological climatological measures (such as elevation, geometry and size) were studied using multiple stepwise discriminant analysis. Of five variables selected the most important are residuals from two trend surfaces on corrie lip and mountain summit elevations. Ice-filled and ice-free corries differ on the average by only 200 m elevation. The importance of global radiation on present glacier distribution was analyzed. Dis-

## Field 02—WATER CYCLE

### Group 2J—Erosion and Sedimentation

criminent analysis shows the degree of difference in terms of global radiation receipts between presently glaciated valleys (north- and east-facing) and two empty (south-facing) valleys. Average daily totals for August 21st were 311 and 398 cal per sq cm, respectively. The discriminant equation was used to find the effects of changes in global radiation due to variations in the obliquity of the ecliptic and elevation on the state of glaciation. These factors can account for up to a 25% shift in the state of glaciation. Other factors, included in any Quaternary climatic model. (See also W73-07869) (Knapp-USGS) W73-07877

#### HYDROGRAPH ANALYSIS AND SOME RELATED GEOMORPHIC VARIABLES, Nebraska Univ., Omaha. Dept. of Civil Engineering.

W. F. Rogers.

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposia Series, p 245-257, 1972. 9 fig, 6 ref.

Descriptors: \*Hydrograph analysis, \*Geomorphology, \*Drainage patterns (geologic), Horton's law, Runoff, Rainfall-runoff relationships, Hydrographs, Infiltration, Drainage density. Identifiers: \*Quantitative geomorphology.

A comparison of the frequency histogram of first order channel distances for drainage basins in Pennsylvania and their hydrographs of runoff from general storms show marked similarity. This close correspondence indicates the shape of the surface runoff hydrograph and is largely controlled by the distribution of first order channel distances. First order drainage channels originate when the tractive force exerted by flowing water is sufficient to move surface sediment. The amount of runoff available to move sediment is a function of the geology and climate. Soils derived from fine grained rocks have lower infiltration rates and higher runoff volume than soils derived from coarser grained rocks in a semiarid climate. Root density and penetration increases in a more humid climate and increases infiltration rates. The number of first order channels is inversely proportional to the infiltration capacity of the soil. Each first order channel acts as a source area for surface runoff. The distribution of first order channel distances from the gage determines the timing of the delivery of water to the gage. (See also W73-07869) (Knapp-USGS) W73-07878

#### PREDICTING TIME-OF-TRAVEL IN STREAM SYSTEMS, Illinois State Water Survey, Urbana.

J. B. Stall.

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposia Series, p 259-271, 1972. 7 fig, 1 tab, 7 ref.

Descriptors: \*Travel time, \*Streamflow, \*Dye releases, \*Illinois, Path of pollutants, Hydraulics, Channel morphology, Geomorphology. Identifiers: \*Quantitative geomorphology.

Stream discharge, cross-sectional area, velocity, width and depth are consistently related to drainage area and flow frequency in the 5250-square-mile basin of the Kaskaskia River basin in Illinois. A set of five hydraulic geometry equations represent quantitatively these interrelationships. Mean velocities at various locations in this stream system are averaged for various stream reaches to provide average time-of-travel. Computed time-of-travel for a 65-mile reach of the Kaskaskia River was compared to actual time-of-travel of an injection of dye. Computed values were good at high flows, and fair at medium flows. At low flow the

computed value is a minimum expected time-of-travel. Actual time-of-travel may be much longer due to trapping of the dye in pools in the streambed upstream from riffles. Computed time-of-travel curves are presented for this 65-mile reach of the Kaskaskia River. (See also W73-07869) (Knapp-USGS) W73-07879

#### HYDROGEOMORPHOLOGY OF SUSQUEHANNA AND DELAWARE BASINS, State Univ., of New York, Binghamton. Dept. of Geology.

D. R. Coates.

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposia Series, p 273-306, 1972. 12 fig, 8 tab, 18 ref.

Descriptors: \*Geomorphology, \*River basins, \*Streamflow, \*Delaware River, Hydrogeology, Water yield, Hydrology, Surface waters, River systems, Valleys, Topography, Alluvial channels, Alluvium, Low flow, Rainfall-runoff relationships.

Identifiers: \*Quantitative geomorphology, \*Susquehanna River Basin.

A unified study of hydrology, geology, and geomorphology of river basins in the glaciated Appalachian Plateau of New York and Pennsylvania was made to evaluate the U.S. Geological Survey stream gaging network and to develop parameters of low flow in ungauged streams. New indices developed include a sandstone index, a rock massiveness index, a stream relief number, a valley fill ratio, and a morphologic classification system. The 13 Delaware basins in the rugged Catskill Mountains with terrigenous sandstones are contrasted with 12 Susquehanna basins of more subdued topography with marine shales. The Catskill region has greater relief, smaller drainage density, steeper topographic slopes and stream gradients, higher sandstone and massiveness numbers, less valley fill, and more precipitation and streamflow. Delaware basins have more uniform characteristics than Susquehanna basins. More than 90 percent of the low streamflow variance in Delaware basins is explained by precipitation and discharge parameters, whereas hydrologic indicators are unimportant predictors of low streamflow in Susquehanna basins. Susquehanna low streamflow characteristics are related to valley fill materials. Glaciation has greatly influenced both the physical nature of Susquehanna basins and their hydrologic response system, but is less important in Delaware basins. (See also W73-07869) (Knapp-USGS) W73-07880

#### QUANTITATIVE GEOMORPHOLOGY FOR TEST FACILITY EVALUATION AT YUMA PROVING GROUND, Army Topographic Command, Washington, D.C.

J. A. Millett.

In: Quantitative Geomorphology—Some Aspects and Applications, Proc of 2nd Annual Geomorphology Symposia Series, p 307-313, 1972. 2 fig.

Descriptors: \*Geomorphology, \*Mapping, \*Deserts, \*Topography, \*Military aspects, \*Arizona, Terrain analysis, On-site investigations, Slopes, Surveys.

Identifiers: \*Quantitative geomorphology, \*Military geomorphology, \*Yuma (Ariz).

A simplified method for quantifying desert terrain at Yuma Proving Ground uses field measurements of slope and relief, and mapping of unconsolidated materials. The field data, presented primarily as cumulative frequency curves, are useful in engineering evaluation of test-area suitability for traffic mobility and visibility. The data are further applicable to an overall description of terrain, to

an estimate of the accuracy of maps, including seven identified mapping units, and to establishing base areas for environmental testing. (See also W73-07869) (Knapp-USGS) W73-07881

#### SPLASH EROSION RELATED TO SOIL ERODIBILITY INDEXES AND OTHER FOREST SOIL PROPERTIES IN HAWAII,

Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station. T. Yamamoto, and H. W. Anderson. Water Resources Research, Vol 9, No 2, p 336-345, April 1973. 2 fig, 6 tab, 18 ref.

Descriptors: \*Soil erosion, \*Impact (Rainfall), \*Hawaii, \*Forest soils, Erosion, Simulated rainfall, Regression analysis, Moisture content, Organic matter, Infiltration. Identifiers: \*Splash erosion.

Losses of Hawaiian forest soils under simulated rainfall were used to test indexes of erodibility based on soil aggregate size and Middleton's suspension percent. Soil samples were collected on the Koolau and Waianae ranges on Oahu, Hawaii. Soil losses were related by regression on principal components to eight factors: soil erodibility index, bulk density, saturation soil moisture content, precipitation excess, organic matter content, geologic type, vegetation type, and climatic zone at the sampling site. Equations that included the percent of water stable aggregates 0.25-0.50 mm in size produced the highest explained variation: 81% in gross splash erosion and 66% in maximum splash rate. Gross splash was related to a soil erodibility index, bulk density, and infiltration and saturation moisture content; in contrast, maximum splash erosion variation was related to organic matter content as well as to an erodibility index and the bulk density of the soil. Ash and basal colluvium soils required more careful management than basalt soils because of their higher maximum splash rates. (Knapp-USGS) W73-07888

#### SEEPAGE STEPS IN THE NEW FOREST, HAMPSHIRE, ENGLAND,

C. G. Tuckfield.

Water Resources Research, Vol 9, No 2, p 367-377, April 1973. 9 fig, 1 tab, 4 ref.

Descriptors: \*Geomorphology, \*Erosion, \*Topography, \*Seepage, \*Springs, Valleys, Groundwater, Soil water, Slopes, Degradation (Slope). Identifiers: \*New Forest (England), \*Seepage steps.

Seepage steps are erosional scarps produced on hillslopes by the removal of material on the downslope side by concentrated seepage. In plan, the scarps form accurate lines approximately following the contour. In profile, four elements can be distinguished: a convex slope above the step, an almost vertical face, a convex debris slope below the face, and often a concave slope beyond the debris slope. In the New Forest, Hampshire, England, the seepage is caused by concentration of water above the junction between a permeable sandstone and an underlying impermeable clay. The seepage face is composed partly of superficial material and partly of the permeable rock, the contact between the two strata being obscured by the debris and found in one case to be 8 meters below the level of the base of the step. The water table was always less than 1 m below the level of the base of the step. The position of the step is determined directly by the level of the water table and indirectly by the clay-sandstone junction. The height of the step varies considerably: the mean maximum height for 54 valley sides is 2.16 m; the absolute maximum height recorded is 6 m. Erosion of the face is active at some points; at other points the feature appears to be relict. It is usually most active near the heads of valleys. (Knapp-USGS) W73-07891

WATER CYCLE—Field 02  
Erosion and Sedimentation—Group 2J

**BOTTOM CURRENTS IN THE HUDSON CANYON,**  
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.  
For primary bibliographic entry see Field 02E.  
W73-0793

**STUDIES ON THE FLUVIAL ENVIRONMENT, ARCTIC COASTAL PLAIN PROVINCE, NORTHERN ALASKA, VOLUMES I AND II.**  
For primary bibliographic entry see Field 02C.  
W73-0796

**BASIC CHARACTERISTICS OF LANDSLIDE PROCESSES (OSNOVNYYE ZAKONOMEROSTI OPOLZNEVYKH PROTSESSOV),**  
Ye. P. Yemel'yanova.  
Izdatel'stvo 'Nedra', Moscow, 1972. 311 p.

Descriptors: \*Mass wasting, \*Landslides, \*Slopes, \*Slope stability, Erosion control, Creep, Solifluction, Mudflows, Earthquakes, Soils, Rockslides, Rocks, Rock properties, Rock mechanics, Structural geology, Groundwater, Climates, Vegetation, Analytical techniques, Forecasting.  
Identifiers: \*USSR, Tectonics.

Investigations of theoretical and practical aspects of landslide processes on natural slopes were based on observations made by the author and on extensive data in Soviet and foreign literature. The origin of landslides is examined in terms of the geological conditions of the area and the effects of groundwater, rock-slope stability, undercutting of slopes, climate, vegetation, neotectonics, and seismic phenomena on slide movements. Techniques for prediction of landslides are accompanied by remedial measures for their prevention and control. (Josefson-USGS)  
W73-0798

**SHELF SEDIMENTS IN THE BAY OF BISCAY,**  
Akademiya Nauk SSR, Kaliningrad. Institut Okeanologii.  
For primary bibliographic entry see Field 02L.  
W73-0792

**SOME CHARACTERISTICS OF TURBIDITY CURRENTS,**  
Sakhalin Kompleksnyi Nauchno-Issledovatel'skii Institut, Yuzhno-Sakhalinsk (USSR).  
For primary bibliographic entry see Field 02L.  
W73-0793

**COLUMBIA RIVER EFFECTS IN THE NORTHEAST PACIFIC: PHYSICAL STUDIES. REPORT OF PROGRESS, JUNE 1971 THROUGH JUNE 1972.**  
Washington Univ., Seattle. Dept. of Oceanography.

Available from NTIS, Springfield, Va., as RLO-2225-T25-6; \$3.00 paper copy, \$1.45 microfiche. Report No. RLO-2225-T25-6, July 1972. 12 p, append.

Descriptors: \*Columbia River, \*Pacific Ocean, \*Hydrology, \*Data collections, \*Surveys, Movement, Dispersion, Diffusion, Ocean circulation, Sedimentology, Sediment transport, Equipment, Instrumentation.

Reports an analysis of coastal circulation and sediment transport on the Washington Shelf on a relatively fine scale in both space and time. The study attempts to relate the variations to the forcing functions and establish such local anomalies as may occur from the Columbia River Mouth north to the Strait of Juan de Fuca. (Houser-ORNL)  
W73-0796

**VISCOELASTIC PROPERTIES OF MARINE SEDIMENTS,**

Texas A and M Univ., College Station. Dept. of Civil Engineering.  
S. H. Carpenter, L. J. Thompson, and W. R. Bryant.

Available from NTIS, Springfield, Va., 22151 as AD-748 647, Price \$3.00 printed copy; \$1.45 microfiche. Texas A and M University Department of Oceanography Technical Report 72-8-T, September 1972. 56 p, 16 fig, 2 tab, 18 ref, 2 append. ONR Contract N00014-68-0308 (0002).

Descriptors: \*Sediments, \*Oceans, \*Bottom sediments, \*Viscosity, \*Viscometers, Stability, Shear strength, Moisture content, Specific gravity, Testing procedures, Curves, Soil types, Soil properties.

Identifiers: Anchor resistance, Submarine bearing capacity.

Because of their high moisture content, marine sediments have characteristics of both solids and liquids. Being neither liquid nor solid it is difficult to evaluate material constants using conventional soil testing equipment or conventional liquid viscometers. However, these properties must be evaluated if problems such as anchor resistance to motion, submarine bearing capacity, and slope instability problems are to be solved. Before properties can be evaluated a theory must exist. Non-linear viscoelastic theory was used and a simple shear device called the shear viscometer was developed. From cores taken in the Gulf of Mexico the shear resistance of marine sediment was the sum of an exponential function of shear deformation and a function of the one-third power of the rate of shear deformation. The shear resistance can also be empirically related to more conventional tests such as vane shear, moisture content, liquid limit, specific gravity, and the depth from which the sample was taken. (Woodard-USGS)  
W73-08070

**THE WEAR OF SANDSTONE BY COLD, SLIDING ICE,**  
Newcastle-upon-Tyne Univ. (England). Dept. of Geography.  
R. Whitehouse.

In: Polar Geomorphology; Institute of British Geographers Special Publication No 4, p 21-31, June 1972. 6 fig, 11 ref.

Descriptors: \*Erosion, \*Glaciation, \*Scour, \*Sandstones, \*Ice, Glaciers, Friction, Laboratory tests, Abrasion, Glaciology, Geomorphology, Mechanical properties.

Erosion of rock by sliding ice is a function of friction. Friction increases with load and with decrease in temperature, but decreases with speed of sliding and duration of sliding in laboratory tests.

This is caused by the formation, at the ice sliding surface, of a thin layer of slightly deformed ice crystals with their c axes normal to the surface; ice so oriented has a very low coefficient of friction. Increase in load or in speed of sliding causes a jerky motion. This stick-slip motion frequently leaves ice adhering to the rock, producing an ice-to-ice sliding surface. The sliding ice shows layers of rock particles analogous to dirt bands in glaciers. Production of rock debris by sliding ice is small, but pebbles in the rock shatter after only seven cycles of freeze-thaw. (Knapp-USGS)  
W73-08074

**TORS, ROCK WEATHERING AND CLIMATE IN SOUTHERN VICTORIA LAND, ANTARCTICA,**  
Keele Univ. (England). Dept. of Geography.  
E. Derbyshire.

In: Polar Geomorphology; Institute of British Geographers Special Publication No 4, p 93-95, June 1972. 8 fig, 35 ref.

Descriptors: \*Weathering, \*Antarctic, \*Erosion, \*Recent epoch, Glaciation, Paleoclimatology, Climatology, Clays, Pleistocene epoch, Snow cover, Deserts, Geomorphology.  
Identifiers: \*Wright Valley (Antarctica), \*Tors.

Morphological and weathering characteristics of a group of tors are described at Sandy Glacier (Wright Valley) in the McMurdo oasis of southern Victoria Land, Antarctica. Clay minerals at and beneath the surface of the rounded corestones indicate chemical weathering of the dolerite. The juxtaposition of rounded and angular tors on the summit of the area is caused by local variations in microclimate, especially as it affects snow cover. Both types of tors are the product of the prevailing polar desert conditions. Such conditions have probably prevailed throughout the Pleistocene with only brief episodes of slightly more maritime climate. (Knapp-USGS)  
W73-08075

**VALLEY ASYMMETRY AND SLOPE FORMS OF A PERMAFROST AREA IN THE NORTHWEST TERRITORIES, CANADA,**  
Cambridge Univ. (England). Dept. of Geography.  
For primary bibliographic entry see Field 02C.  
W73-08076

**MODIFICATION OF LEVEE MORPHOLOGY BY EROSION IN THE MACKENZIE RIVER DELTA, NORTHWEST TERRITORIES, CANADA,**  
Alberta Univ., Edmonton. Dept. of Geography.  
D. Gill.

In: Polar Geomorphology; Institute of British Geographers Special Publication No 4, p 123-138, June 1972. 13 fig, 19 ref. Alberta Univ. Grant (55-32254).

Descriptors: \*Geomorphology, \*Deltas, \*Arctic, \*Permafrost, \*Erosion, Sedimentation, Levees, Alluvial channels, Degradation (Stream), Waves (Water), Surf, Beach erosion, Ice cover, Sea ice, Channel morphology, Stream erosion.  
Identifiers: \*Levees (Natural).

Both erosion and unequal deposition of sediments control the gross morphology of arctic deltas. In addition to normal fluvial erosion, levee morphology in an arctic delta may be significantly modified by wave action, ice abrasion, slumping, solifluction, and thermal degradation of perennially frozen sediment. These processes are analyzed and their effect on levee retreat and rates of aggradation and progradation of slip-off and point bars along shifting channels in the Mackenzie River delta is described. (Knapp-USGS)  
W73-08077

**RELATIONSHIPS BETWEEN PROCESS AND GEOMETRICAL FORM ON HIGH ARCTIC DEBRIS SLOPES, SOUTH-WEST DEVON ISLAND, CANADA,**  
McMaster Univ., Hamilton (Ontario). Dept. of Geography.  
P. J. Howarth, and J. G. Bones.

In: Polar Geomorphology; Institute of British Geographers Special Publication No 4, p 139-153, June 1972. 4 fig, 2 tab, 16 ref.

Descriptors: \*Degradation (Slope), \*Geomorphology, \*Arctic, Canada, Mass wasting, Topography, Stream erosion, Erosion, Slopes, Surf, Beach erosion, Bank erosion.  
Identifiers: \*Devon Island (Canada).

Debris slope profiles were measured at four different locations on southwest Devon Island, N.W.T., Canada. The nature and effects of basal erosion, rockfall and of processes dominated by melt water are described. There are significant differences in angle between slopes affected by different processes. The steepest slopes, tending to

## Field 02—WATER CYCLE

### Group 2J—Erosion and Sedimentation

be convex in form, are produced by basal erosion, which results from both ice push and storm waves. In noncoastal locations, slopes dominated by rockfall are significantly steeper than those affected by processes involving water, although both types of slope tend to be concave in form. The effects of these two processes are also seen in the significant differences between talus sheets (rockfall dominant) and talus cones (melt-water dominant). In coastal areas, however, rockfall slopes and avalanche slopes are both steep because debris is rafted away by sea ice to prevent basal accumulation. There appears to be little difference in geometrical form between High Arctic and mid-latitude slopes if angles and profiles are compared on slopes where similar processes operate in the two environments. (Knapp-USGS) W73-08078

**PROCESSES OF SOIL MOVEMENT IN TURF-BANKED SOLIFLUTION LOBES, OKSTINDAN, NORTHERN NORWAY,**  
University Coll. of Swansea (Wales). Dept. of Geography.  
C. Harris.  
In: *Polar Geomorphology*; Institute of British Geographers Special Publication No 4, p 155-174, June 1972. 9 fig, 7 tab, 13 ref.

Descriptors: \*Creep, \*Solifluction, \*Arctic, \*Degradation (Slope), \*Mass wasting, \*Geomorphology, Permafrost, Soil erosion, Freezing, Thawing, Frost action, Snow cover.

The total annual rates of soil movement on an east-facing arctic slope in Norway were measured, together with soil-moisture conditions, winter frost heave, soil temperatures, the vertical profile of soil movement with depth, and the mechanical properties of the soils. Frost heave is greatest when penetration of the freezing plane through the soil is slow. Soil creep results from both frost heave and expansion and contraction of the soil owing to varying moisture content. Saturated conditions occur for a short period during the spring thaw as a result of drainage being impeded by a frozen subsoil layer. Maximum annual soil movement occurs where saturated conditions persist longest, not where the slope is greatest. Movement takes place by a combined process of creep and flow. (Knapp-USGS) W73-08079

**THE NATURE OF THE ICE-FOOT ON THE BEACHES OF RADSTOCK BAY, SOUTH-WEST DEVON ISLAND, N.W.T., CANADA IN THE SPRING AND SUMMER OF 1970,**  
McMaster Univ., Hamilton (Ontario). Dept. of Geography.  
For primary bibliographic entry see Field 02C.  
W73-08080

**THE SOLUTION OF LIMESTONE IN AN ARCTIC ENVIRONMENT,**  
Bristol Univ. (England). Dept. of Geography.  
For primary bibliographic entry see Field 02K.  
W73-08081

**PROCESSES OF SOLUTION IN AN ARCTIC LIMESTONE TERRAIN,**  
McMaster Univ., Hamilton (Ontario). Dept. of Geography.  
For primary bibliographic entry see Field 02K.  
W73-08082

**APPLICATION OF RHEOLOGICAL MEASUREMENTS TO DETERMINE LIQUID LIMIT OF SOILS,**  
Central Building Research Inst., Roorkee (India).  
For primary bibliographic entry see Field 02G.  
W73-08089

#### PROCESS AND SEDIMENT SIZE ARRANGEMENT ON HIGH ARCTIC TALUS, SOUTHWEST DEVON ISLAND, N.W.T., CANADA.

Alberta Univ., Edmonton. Dept. of Geography.  
J. G. Bones.  
*Arctic and Alpine Research*, Vol 5, No 1, p 29-40, 1973. 4 fig, 3 tab, 19 ref.

Descriptors: \*Talus, \*Sediment sorting, \*Arctic, \*Mass wasting, Rockslides, Variability, Statistics, Correlation analysis, Degradation (Slope).  
Identifiers: \*Devon Island (Canada).

The three dominant processes operating on talus of southwest Devon Island, Canada, produce characteristic arrangements in size of surface fragments. On 25 of the 27 surfaces measured, zonal (upslope-downslope) variance accounts for a much higher proportion of size variation than does lateral (cross-slope) variation. This characteristic supports the hypothesis of fall-sorting and reverse fall-sorting of rock fragments as the fundamental mode of talus formation. At present, 66% of the rockfall taluses have statistically significant zonal size arrangements, compared to 50% on talus with basal erosion and only 40% on alluvial talus. Basal erosion and meltwater activity may either reinforce or obscure the original downslope arrangement, depending upon the form of the process, its magnitude and frequency. Comparison of similar studies by way of statistical power analysis reveals considerable support for these findings. (Knapp-USGS) W73-08090

#### NATURE AND RATE OF BASAL TILL DEPOSITION IN A STAGNATING ICE MASS, BURROUGHS GLACIER, ALASKA,

Ohio State Univ. Research Foundation, Columbus, Inst. of Polar Studies.  
D. M. Mickelson.  
*Arctic and Alpine Research*, Vol 5, No 1, p 17-27, 1973. 5 fig, 2 tab, 17 ref. NSF Grant GA-12300.

Descriptors: \*Till, \*Glaciers, \*Alaska, \*Sedimentation rates, Glaciation, Glacial sediments, Glacial drift, Arctic.  
Identifiers: \*Burroughs Glacier (Alaska).

Rates of basal till deposition ranging from 0.5 to 2.5 cm per year were observed in the Burroughs Glacier in southeast Alaska. Because of the emergence of hills during deglaciation, a change in ice flow direction of up to 90 deg has occurred near the southeast terminus. Because this change is recorded by maps and photographs dating to 1892, a rate of change of ice flow direction could be estimated. Till fabric measurements and till composition at two or three depths in the till at seven localities reflect this change. Estimates of the rate of till deposition were obtained by assuming that the fabric azimuth represents the ice flow direction at the time the till was deposited. Most till deposition took place during late stages of deglaciation. At two locations fabric of till just above bedrock or a paleosol records a post-1892 flow direction. (Knapp-USGS) W73-08091

#### CHARACTERISTICS AND GEOMORPHIC EFFECTS OF EARTHQUAKE-INITIATED LANDSLIDES IN THE ADELBERT RANGE, PAPUA NEW GUINEA,

Australian National Univ., Canberra. Dept. of Biogeography and Geomorphology.  
C. F. Pain.

*Engineering Geology*, Vol 6, No 4, p 261-274, December 1972. 8 fig, 1 tab, 13 ref.

Descriptors: \*Landslides, \*Earthquakes, \*Mudflows, \*Tropical regions, \*Debris avalanches, Mass wasting, Vegetation effects, Geomorphology, Slopes, Forests.  
Identifiers: \*Papua New Guinea.

On November 1, 1970, an earthquake of magnitude 7.0 occurred 32 km north of Madang on the north coast of Papua New Guinea, and on the fringes of the Adelbert Range. Dense landsliding occurred over an area of 240 sq km. Debris avalanches removed shallow soil and forest vegetation from slopes of 45 deg. Earthflows occurred on deeper soils and lower angled slopes. The nature of the landslides and disposition of the vegetation debris suggest that falling trees triggered the landslides during the earthquake. Logs in the deposits were an important influence on the movement of landslide debris in the channel systems. (Knapp-USGS) W73-08092

#### POSSIBLE ACCUMULATION OF AUTHIGENIC, EXPANDABLE-TYPE CLAY MINERALS IN THE SUBSTRUCTURE OF TUTTLE CREEK DAM, KANSAS, U.S.A.,

New Mexico Univ., Albuquerque. Dept. of Geology.

For primary bibliographic entry see Field 02K.

W73-08093

#### THE FORMATION OF IRON AND MANANESE-RICH LAYERS IN THE HOLOCENE SEDIMENTS OF THUNDER BAY, LAKE SUPERIOR,

Lakehead Univ., Thunder Bay (Ontario).

J. S. Mothersill, and R. J. Shegelski.

*Canadian Journal of Earth Sciences*, Vol 10, No 4, p 571-576, April 1973. 3 fig, 1 tab, 19 ref.

Descriptors: \*Bottom sediments, \*Lake Superior, \*Iron, \*Manganese, Connate water, Chemical precipitation, Ion transport, Mass transfer.

Thin iron- and manganese-rich layers occur within or just below the Holocene sediments of Thunder Bay, Lake Superior. Most of the iron and manganese was solubilized by connate waters under the reducing conditions of the early burial stage, subsequently migrated upward with the connate waters along vertical fractures during compaction, and then eventually deposited as oxides along favorable Eh horizons. (Knapp-USGS) W73-08135

#### ATLANTIC CONTINENTAL SHELF AND SLOPE OF THE UNITED STATES—SAND-SIZE FRACTION OF BOTTOM SEDIMENTS, NEW JERSEY TO NOVA SCOTIA,

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 02L.

W73-08137

#### QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART I. NORTH ATLANTIC SLOPE BASINS,

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 07C.

W73-08155

#### SURFICIAL SEDIMENTS OF BARKLEY SOUND AND THE ADJACENT CONTINENTAL SHELF, WEST COAST VANCOUVER ISLAND,

British Columbia Univ., Vancouver. Dept. of Geology.

For primary bibliographic entry see Field 02L.

W73-08156

#### MAP OF DEPOSITS ESPECIALLY SUSCEPTIBLE TO COMPACTION OR SUBSIDENCE, PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO,

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 07C.

W73-08174

## WATER CYCLE—Field 02

### Erosion and Sedimentation—Group 2J

**WIND ERODIBILITY AS INFLUENCED BY RAINFALL AND SOIL SALINITY**,  
Agricultural Research Service, Manhattan, Kans.  
Soil and Water Conservation Research Div.  
L. Lyles, and R. L. Schrandt.  
Soil Science, Vol 114, No 5, p 367-372, November  
1972. 8 fig, 3 tab, 10 ref.

Descriptors: \*Wind erosion, \*Rainfall intensity, \*Salinity, Soil moisture, Saline soils, Soil erosion, Wind velocity, Particle size.

The combined effects of added sodium, calcium and magnesium chloride salts, rainfall intensity and rainfall duration on wind erodibility and mechanical strength of a sandy soil were evaluated in a laboratory study. Loss by wind from sodium chloride-treated soil was significantly less than from nonsaline soil or from soil treated with the other salts. Soil loss following low-intensity rain was less than that following high-intensity rain for the salt-duration combinations studied. Except for short-duration rains at low intensity, rainfall duration did not significantly affect soil loss. The sodium chloride-treated soil increased in mechanical strength following rainfall and drying much more than did nonsaline soil or soils treated with other salt combinations, regardless of rainfall intensity or duration. (Knapp-USGS)  
W73-08355

**EQUATION FOR DESCRIBING THE FREE-SWELLING OF MONTMORILLONITE IN WATER**,  
Agricultural Research Service, Phoenix, Ariz.  
Water Conservation Lab.  
For primary bibliographic entry see Field 02G.  
W73-08356

**RIVERBED FORMATION**,  
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 07B.  
W73-08365

**SEASONAL VARIATION OF A LIMNIC BEACH**,  
Catholic Univ. of America, Washington, D.C.  
Dept. of Geography.  
R. N. Dubois.  
Geological Society of America Bulletin, Vol 84, No 5, p 1817-1824, May 1973. 3 fig, 3 tab, 24 ref.

Descriptors: \*Lakes, \*Beaches, \*Lake Michigan, \*Water levels, \*Beach erosion, Geomorphology, Limnology, Sand bars, Water level fluctuations, Winds, Waves (Water).  
Identifiers: Limnic beaches.

Limnic beaches respond to seasonal variations in lake water levels. Along the beach of Lake Michigan at Terry Andrae State Park, Wisconsin, with rising lake level from April through July, the foreshore migrates inland on an upward inclined plane, decreasing both beach and backshore width, and decreasing the elevational difference between an overhead fixed plane and the foreshore crest and beach step. These processes are reversed when lake level subsides from August through November. The net result is that the beaches of Lake Michigan, and presumably those of the remaining Great Lakes, retrograde from spring to summer, and prograde from summer to winter. In general, foreshore slope and width are independent to lake level. Foreshore slope is directly linked to the density of the foreshore sediments, while foreshore width is directly proportional to wave dimensions and is independent of the foreshore slope. (Knapp-USGS)  
W73-08371

**FROSTED BEACH-SAND GRAINS ON THE NEWFOUNDLAND CONTINENTAL SHELF**,  
Memorial Univ. of Newfoundland, St. John's.  
Dept. of Geology.  
R. M. Slatt.  
Geological Society of America Bulletin, Vol 84, No 5, p 1807-1812, May 1973. 4 fig, 24 ref. Canada Grants 29-71, A-8395, and E-2164.

Descriptors: \*Sands, \*Beaches, \*Continental shelf, \*Particle shape, \*Particle size, Distribution patterns, Sedimentology, Electron microscopy, Frequency analysis, Sediments, Stratigraphy. Identifiers: Newfoundland.

Frosted, relict beach sands are found in 90 m of water on part of the Newfoundland continental shelf. In this case, the common interpretation that frosted sands on the Atlantic continental shelf are indicative of aeolian deposition during periods of Pleistocene eustatic lowering of sea level would be incorrect. Combined grain-size frequency distribution analysis and grain-surface texture analysis with a scanning electron microscope are probably necessary to properly evaluate the depositional environment of frosted grains. (Knapp-USGS)  
W73-08372

**REVERSING BARCHAN DUNES IN LOWER VICTORIA VALLEY, ANTARCTICA**,  
Lunar Science Inst., Houston, Tex.  
J. F. Lindsay.  
Geological Society of America Bulletin, Vol 84, No 5, p 1799-1806, May 1973. 5 fig, 13 ref. NSR 09-051-001.

Descriptors: \*Dunes, \*Antarctic, Sediment transport, Dune sands, Sands, Particle size. Identifiers: \*Victoria Valley (Antarctica).

Approximately 30 reversing barchan dunes occur along the northern side of lower Victoria Valley, Antarctica. Laminae which dip steeply upwind suggest that much of the internal structure of the dunes develops during periods when the wind reverses itself—possibly during winter. Although the dune cores are frozen and the migration of the dunes are similar in texture to some barchans of more temperate climates. (Knapp-USGS)  
W73-08373

**VENTIFACT EVOLUTION IN WRIGHT VALLEY, ANTARCTICA**,  
Lunar Science Inst., Houston, Tex.  
J. F. Lindsay.

Geological Society of America Bulletin, Vol 84, No 5, p 1791-1798, May 1973. 10 fig, 12 ref. NSR 09-051-001.

Descriptors: \*Erosion, \*Antarctic, \*Wind erosion, \*Particle shape, Sampling, Weathering, Particle size. Identifiers: \*Ventifacts, \*Wright Valley (Antarctica).

Ventifacts occurring on extensive wind-deflated surfaces throughout ice-free Wright Valley, Antarctica, are the product of complex evolutionary processes. Initially, the wind removes the -2.0 to 1.5 phi fraction of valley soils to produce a lag gravel. The lag gravel then continues to evolve at a reduced rate as coarser granule and gravel fractions are removed. The distribution of wind-polished faces is determined largely by the shape of the original unpolished rock fragments. Once ventification is initiated, the number of faces per clast declines rapidly as minor faces are removed by the polishing. As ventification proceeds, the trend is reversed as the ventifacts are reoriented by the wind and new faces form. Salt weathering is also a major factor in determining the morphology of the Wright Valley ventifacts, proceeding more slowly than ventification. (Knapp-USGS)  
W73-08374

**SIMULATION MODEL FOR STORM CYCLES AND BEACH EROSION ON LAKE MICHIGAN**,  
Williams Coll., Williamstown, Mass.  
W. T. Fox, and R. A. Davis, Jr.  
Geological Society of America Bulletin, Vol 84, No 5, p 1769-1790, May 1973. 15 fig, 1 tab, 38 ref. ONR Contract NR 388-092.

Descriptors: \*Beach erosion, \*Lake Michigan, \*Simulation analysis, \*Mathematical models, Sand bars, Surf, Waves (Water), Profiles, Littoral drift, Currents (Water), Storms, Mapping, Geomorphology.

A mathematical simulation model relates storm cycles, beach erosion, and nearshore bar migration in Lake Michigan. The model is based on Fourier analysis of weather and wave data collected during the summers of 1969 and 1970. Barometric pressure is used as the independent variable with longshore current velocity computed as the first derivative and breaker height as a filtered version of the second derivative of barometric pressure. The simulated curves are used to compute wave and longshore current energy for each storm cycle and poststorm recovery. A gently sloping linear plus quadratic surface is used to represent the barless topography, with bars and troughs generated by normal curves. Bar distance is computed as a function of wave energy and bottom slope. Position of the bar and trough along the shore is determined by wave and longshore current energy. Simulated maps are produced for each storm cycle and recovery. (Knapp-USGS)  
W73-08375

**EFFECTS OF HURRICANE GINGER ON THE BARRIER ISLANDS OF NORTH CAROLINA**,  
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.  
R. Dolan, and P. Godfrey.

Geological Society of America Bulletin, Vol 84, No 4, p 1329-1333, April 1973. 4 fig, 8 ref.

Descriptors: \*Sediment transport, \*Beach erosion, \*Barrier islands, \*Surf, \*Geomorphology, Beaches, North Carolina, Hurricanes, Waves (Water), Sand bars, Seashores. Identifiers: \*Cape Hatteras (NC).

The two barrier-island systems of North Carolina responded to the storm waves and surges of Hurricane Ginger in strikingly different manners. In the northern sector, which has been stabilized by artificial barrier dunes, erosion and dune recession were extensive. In the southern sector, as yet relatively unmodified, overwash and associated deposition were the dominant processes. Overwash is the major means by which the low barrier islands of the mid-Atlantic retreat before the rising sea, and it is the manner in which coarse sand and shell are transported inland from the beach. The barrier-island systems are constructed mostly of overwash-type sediments from the littoral zone. If sea level continues to rise, the resources required to maintain artificial barrier dunes may exceed the economic and psychologic value attached to their existence. The barrier islands, in their natural condition, are able to survive severe perturbations of hurricanes and extratropical storms by the wide runup and overwash profile they present to surges. These unmodified islands are not being washed away, as some engineers and developers have suggested in the past, but rather they are moving back by natural processes fundamental to their origin. (Knapp-USGS)  
W73-08378

**BEACH PROTECTION SYSTEM**,  
For primary bibliographic entry see Field 08A.  
W73-08393

**LAKE SEDIMENTS IN NORTHERN SCOTLAND**,  
Leicester Univ. (England).

## Field 02—WATER CYCLE

### Group 2J—Erosion and Sedimentation

W. Pennington, E. Y. Haworth, A. P. Bonny, and J. P. Lishman.  
Philos Trans R Soc Lond Ser B Biol Sci. Vol 264, No 861, p 191-294. 1972. Illus.  
Identifiers: Diatoms, \*Lake sediments, Pollen, \*Scotland, \*Sediments, Zones.

A survey of deep-water sediments in 11 lakes in northern Scotland showed that only under certain conditions does a complete and conformable series of deposits accumulate. In lochs exposed to strong winds there may be no permanent settling of organic sediments in water depths of up to 50 m. Three lake cores (representative of 3 regions of northern Scotland), which proved to be complete and conformable profiles, were analyzed in detail for pollen and certain chemical elements; one was also analyzed for diatoms. A series of <sup>14</sup>C dates was obtained for 2 of these profiles. Changes in pollen content were found to be very consistently related to changes in sediment composition. Pollen zones were defined in terms of characteristic taxa, and variance in sediment composition was expressed as the first component of a Principal Components Analysis; changes in this first component invariably coincided with pollen zone boundaries based on changes in pollen spectra. This close relationship is explained as the consequence of the derivation of these lake sediments from soils on the catchments. Significance of the pollen spectra and analysis of the core samples are discussed.—Copyright 1973, Biological Abstracts, Inc.  
W73-08425

### 2K. Chemical Processes

THERMOCHEMICAL INVESTIGATION OF DIMETHYLMERCURY IN AQUEOUS AND NONAQUEOUS SOLUTIONS, Missouri Univ., Rolla. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-07806

PH BUFFERING OF PORE WATER OF RECENT ANOXIC MARINE SEDIMENTS, California Univ., Los Angeles. Dept. of Geology. For primary bibliographic entry see Field 05B. W73-07851

MORE ON NOBLE GASES IN YELLOWSTONE NATIONAL PARK HOT WATERS, Israel Atomic Energy Commission, Rehovoth; and Weizmann Inst. of Science, Rehovoth (Israel). E. Mazor, and R. O. Fournier. Geochimica et Cosmochimica Acta, Vol 37, No 3, p 515-525, March 1973. 5 fig, 2 tab, 14 ref.

Descriptors: \*Gases, \*Thermal water, \*Argon, \*Helium, Hydrothermal studies, Krypton radioisotopes, Water circulation, Groundwater movement, Water sources, Geysers. Identifiers: \*Yellowstone National Park, \*Noble gases.

Water and gas samples from research wells in hydrothermal areas of Yellowstone National Park were analyzed for their rare gas contents and isotopic composition. The rare gases originate from infiltrating runoff water, saturated with air at 10 to 20 deg C. The atmospheric rare gas retention values found for the water varied between 3% and 87%. The fine structure of the Ar, Kr and Xe abundance pattern in the water reveals fractionational enrichment of the heavier gases due to partial outgassing of the waters. Radiogenic He and Ar were also detected. No positive evidence was found for magmatic water contribution. If present, the proportion of magmatic water is significantly less than 13% to 36%. (Knapp-USGS)  
W73-07853

ALKALINITY DETERMINATION IN INTERSTITIAL WATERS OF MARINE SEDIMENTS, Scripps Institution of Oceanography, La Jolla, Calif. For primary bibliographic entry see Field 02J. W73-07867

MOVEMENT OF CHEMICALS IN SOILS BY WATER, Illinois Univ., Urbana. Dept. of Agronomy. For primary bibliographic entry see Field 02G. W73-07904

MODELING THE MOVEMENT OF CHEMICALS IN SOILS BY WATER, Illinois Univ., Urbana. Dept. of Agronomy. For primary bibliographic entry see Field 02G. W73-07905

SE IN WATER OF THE CASPIAN AND AZOV SEAS, For primary bibliographic entry see Field 05B. W73-07970

WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS: A PROGRESS REPORT, National Sanitation Foundation, Ann Arbor, Mich. For primary bibliographic entry see Field 05A. W73-08027

SEPARATION AND QUANTITATIVE DETERMINATION OF THE YTTRIUM GROUP LANTHANIDES BY GAS-LIQUID CHROMATOGRAPHY, Iowa State Univ., Ames. Inst. for Atomic Research; and Iowa State Univ., Ames. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-08033

SUPPORT-BONDED POLYAROMATIC COPOLYMER STATIONARY PHASES FOR USE IN GAS CHROMATOGRAPHY, Applied Automation, Inc., Bartlesville, Okla. Systems Research Dept. For primary bibliographic entry see Field 07B. W73-08034

ELECTROCHEMICAL CELL AS A GAS CHROMATOGRAPH-MASS SPECTROMETER INTERFACE, Northgate Lab., Hamden, Conn. W. D. Dencker, D. R. Rushneck, and G. R. Shoemaker. Analytical Chemistry, Vol 44, No 11, p 1753-1758, September, 1972. 8 fig, 12 ref.

Descriptors: \*Gas chromatography, \*Mass spectrometry, \*Instrumentation, Design, Performance, Methodology, Construction, Operations, Laboratory equipment. Identifiers: \*Palladium diffusion electrodes, \*Electrochemical cell, \*Mechanical interface, Detection limits.

An electrochemical cell employing palladium alloy diffusion electrodes has been developed to remove the hydrogen carrier gas exiting a gas chromatograph. Electrochemical pumping removes greater than 99.996 percent of the hydrogen, resulting in mass spectrometer inlet pressures less than .01 micro Torr. Construction details, electrode activation procedures, and performance characteristics of the cell are described. (Long-Battelle) W73-08035

COLORIMETRIC DETERMINATION OF CALCIUM USING REAGENTS OF THE GLYOXAL BIS (2-HYDROXYANIL) CLASS, Clemson Univ., S.C. Dept. of Chemistry and Geology. For primary bibliographic entry see Field 05A. W73-08040

ELECTROCHEMICAL CHARACTERISTICS OF THE GOLD MICROMESH ELECTRODE, Wisconsin Univ., Madison. Dept. of Chemistry. W. J. Blaedel, and S. L. Boyer. Analytical Chemistry, Vol. 45, No. 2, p 258-263, February 1973. 9 fig, 2 tab, 12 ref.

Descriptors: \*Design, \*Construction, Electrochemistry, Flow rates, Zeta potential, Physical properties, Electric currents. Identifiers: \*Electrochemical properties, \*Gold micromesh electrode, Ion selective electrodes.

The design and construction of a flow-through gold micromesh electrode are described. Current-voltage curves are reported for various flow rates. Measured limiting currents are shown to be directly proportional to the number of screens (N) in the electrode, to the concentration of electroactive material (C), and to the cube root of the volume flow rate (V) of the solution through the electrode. Various mesh sizes are examined. Application is made to the measurement of sub-micromolar concentrations. (Holman-Battelle) W73-08044

OSCILLOMETRIC TITRATION OF INORGANIC HALIDES WITH MERCURY (II) ACETATE, Orszagos Gyogyszereseti Intezet, Budapest (Hungary). For primary bibliographic entry see Field 05A. W73-08050

THE SOLUTION OF LIMESTONE IN AN ARCTIC ENVIRONMENT, Bristol Univ. (England). Dept. of Geography. D. I. Smith.

In: Polar Geomorphology; Institute of British Geographers Special Publication No 4, p 187-200, June 1972. 3 fig, 2 tab, 33 ref.

Descriptors: \*Weathering, \*Limestones, \*Arctic, \*Snow cover, Carbon dioxide, Vegetation effects, Solubility, Water chemistry, Melt water, Temperature, Weather, Canada, Geomorphology.

The weathering of limestone was studied in a high-latitude Arctic environment. The study area is in a limestone region of northwestern Somerset Island at latitude 74 deg N in arctic Canada. Some 200 water samples were analyzed in the field for their calcium and magnesium content and pH; additional analyses were made of bedrock samples. The total hardness values were generally less than 95 ppm; taking precipitation and evapotranspiration figures into account, this suggests a weathering rate equivalent to about 2 mm/1000 years. Both the concentration of solutes and the weathering rate are considerably less than those found in lower latitudes. The lack of soil cover is thought to be the significant factor. There is evidence to suggest that solution of limestone is concentrated at the snow-rock interface. The concentration of carbon dioxide is no greater than that found in the free atmosphere. The area has been ice free for about the last 10,000 years and the rates of solution indicate that no major development of sub-nival hollows by solutional erosion could have occurred during this period. (Knapp-USGS) W73-08081

PROCESSES OF SOLUTION IN AN ARCTIC LIMESTONE TERRAIN, McMaster Univ., Hamilton (Ontario). Dept. of Geography.

## WATER CYCLE—Field 02

### Chemical Processes—Group 2K

#### J. G. Cogley.

In: *Polar Geomorphology*; Institute of British Geographers Special Publication No 4, p 201-211, June 1972. 5 fig, 1 tab, 7 ref.

Descriptors: \*Erosion, \*Weathering, \*Limestones, \*Arctic, Canada, Snow cover, Solubility, Stream erosion, Sediment yield, Water chemistry, Melt water, Temperature, Geomorphology, Stream erosion.

Material is removed from the landscape in arctic regions by the same fluvial agents as in mid-latitude regions. The snowmelt runoff season is short; it is characterized by a major spring flood and a longer period of low flow, interrupted by occasional rainstorm floods. Up to 90% of annual runoff occurs during the spring flood. On Devon Island, Canada, bedload movement is confined to this period and to the rainstorm floods, and suspended sediment discharge is small except at these times. Solute concentrations vary inversely with discharge but are less variable than those of suspended sediment. In a small drainage basin in limestone terrain on Devon Island, running water dissolves some limestone. The stream draining the basin flowed between June 26 and August 16 in 1970, reaching a maximum discharge of 1.42 cu m per sec on July 2. Concentration of dissolved calcium and magnesium reached a maximum of 102 mg/liter at a discharge of 0.067 cu m per sec on July 22. Solute load (Ca and Mg) was greater than suspended load. Solute concentration varies with the duration or distance over which solution occurs, as well as with discharge. Rainwater is a more effective solvent than old, melting snow. (Knapp-USGS)

W73-08082

#### POSSIBLE ACCUMULATION OF AUTHIGENIC, EXPANDABLE-TYPE CLAY MINERALS IN THE SUBSTRUCTURE OF TUTTLE CREEK DAM, KANSAS, U.S.A.,

New Mexico Univ., Albuquerque. Dept. of Geology.

D. G. Brookins.

Engineering Geology, Vol 6, No 4, p 251-259, December 1972. 2 fig, 4 tab, 7 ref. NSF Grant GA-10839.

Descriptors: \*Water chemistry, \*Clay minerals, \*Dams, \*Kansas, \*Mineralogy, Expansive clays, Dam failure, Dam foundations, Montmorillonite, Cation adsorption, Ion exchange.

Identifiers: Authigenic clay formation.

The chemistry of the water from relief wells south of Tuttle Creek Dam, Kansas, is favorable for the formation of authigenic montmorillonitic and mixed-layer clays. The montmorillonitic and mixed-layer clays are very undesirable in a dam's structure because of their ion exchange capacity, swellability, and compressibility; these factors can shorten the life of an earthfill dam. The water chemistry of the relief wells is similar to that of many of the wells in the Blue River Valley and Kansas River Valley below the dam. Clay mineralogic study coupled with a Rb-Sr geochronologic study indicates that an allochthonous origin for the clays is probable. Therefore the dam is not being weakened by authigenic clay deposition. (Knapp-USGS)

W73-08093

#### QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART I. NORTH ATLANTIC SLOPE BASINS.

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 07C.

W73-08155

#### DISSOLVED HELIUM IN GROUNDWATER: A POSSIBLE METHOD FOR URANIUM AND THORIUM PROSPECTING.

McMaster Univ., Hamilton (Ontario). Dept. of Physics.

#### W. B. Clarke, and G. Kugler.

Economic Geology, Vol 68, No 2, p 243-251, March-April 1973. 6 fig, 1 tab, 15 ref.

Descriptors: \*Helium, \*Uranium radioisotopes, \*Tritium, \*Groundwater, \*Isotopes studies, Radioactive dating, Radiochemical analysis, Water chemistry, \*Canada.

Identifiers: \*Thorium.

Measurement of dissolved helium in groundwater should indicate the presence of uranium (or thorium) mineralization; such measurements were made near two known deposits, near Elliot Lake, Ontario, and near Inda Lake, Labrador. Helium contents of up to 600 times normal solubility were found, while neon contents were all within 20% of solubility equilibrium with the atmosphere. The ratio of He-4 to He-3 is highly correlated with He-4 content, although He-3 is enriched above solubility (up to a factor of 6) in some cases. Tritium content of the Labrador samples indicates that the water residence time is less than 20 years. This rules out the possibility that the high helium values are due to rocks of 'normal' uranium and thorium content. (Knapp-USGS)

W73-08157

#### RECORDS OF WELLS AND TEST BORINGS IN THE SUSQUEHANNA RIVER BASIN, NEW YORK.

Geological Survey, Albany, N.Y.

For primary bibliographic entry see Field 07C.

W73-08159

#### MAP SHOWING GENERAL CHEMICAL QUALITY OF GROUNDWATER IN THE SALINAQUADRANGLE, UTAH.

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 07C.

W73-08172

#### AN EXPERIMENTAL STUDY OF THE STRUCTURE, THERMODYNAMICS AND KINETIC BEHAVIOR OF WATER.

Midwest Research Inst., Kansas City, Mo.

For primary bibliographic entry see Field 01A.

W73-08188

#### AUTOMATED DATA HANDLING USING A DIGITAL LOGGER,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.

For primary bibliographic entry see Field 07C.

W73-08257

#### DEMOULTABLE RING-DISK ELECTRODE,

Illinois Univ., Urbana. School of Chemical Sciences.

For primary bibliographic entry see Field 07B.

W73-08260

#### LINEAR AND NONLINEAR SYSTEM CHARACTERISTICS OF CONTROLLED-POTENTIAL ELECTROLYSIS CELLS,

California Univ., Livermore. Lawrence Livermore Lab.

J. E. Harrar, and C. L. Pommernacki.

Analytical Chemistry, Vol 45, No 1, p 57-78, January 1973. 24 fig, 2 tab, 9 ref.

Descriptors: \*Electrochemistry, Instrumentation, Control systems, \*Electrolysis, Design, Model studies.

Identifiers: \*Ion selective electrodes, \*Transfer functions, Mercury electrodes, Platinum electrodes, Electrolytes.

A detailed study was made of the characteristics of three-electrode controlled-potential electrolysis cells as components of control systems. In the absence of significant faradaic current, these cells

can be represented as linear, bridge-T type networks. Important parameters that determine cell response are the reference electrode resistance and a parasitic capacitance that couples the cell input to the output. Cells whose electrodes are arranged for optimum dc potential distribution were also found to have the minimum phase shift for a given attenuation, and on the basis of the circuit model the phase shift will not exceed 90 degrees. Cells with poor geometry exhibit excessive phase shift in their transfer functions. In the presence of significant faradaic current, the fundamental frequency transfer function is altered considerably and at applied potentials near the current-potential waves the cells are nonlinear. Negative-admittance reactions can cause the cell phase shift to be more negative than -90 degrees, but most faradaic reactions cause the cell to exhibit less phase shift than the background solution value. Sufficient conditions for system stability, taking into account the time-varying, nonlinear, and other complicating characteristics of the cells, can be rigorously obtained using the circle criterion. Several aspects of electrochemical system design and measurement are discussed. (Little-Battelle) W73-08261

#### THE EFFECT OF SODIUM ALKYL BENZENE-SULPHONATE ON THE DRAINAGE OF WATER THROUGH SAND,

Westfield Coll., London (England). Dept. of Zoology.

J. E. Webb, and C. M. Earle.

Environ. Pollut., Vol 3, No 2, p 157-169, 1972, Illus.

Identifiers: \*Alkylbenzenesulfonate, Cations, \*Drainage, Pores, Rates, \*Sand, Size, Sodium, Surfactant, Soil-water movement.

Sodium alkylbenzene sulfonate at 125-700 ppm caused an 80% reduction in the drainage rate of water through Leighton Buzzard sand in which the size of the pores formed by 3 grains in contact did not exceed 0.10 mm. This effect was not due to high viscosity and disappeared in coarser sands. It also disappeared in sand with the O2 atoms at the quartz surface replaced by trimethylsiloxy groups, suggesting an interaction between the sodium alkylbenzene sulfonate ion-pairs and the quartz surface at O2 sites. Molar equivalents of K and Mg cations, introduced as the sulfate to compete for the O2 sites, eliminated the reduction in drainage rate within 15 min. But, at 5% of the molar equivalent, the full effect was delayed for 4 hr, indicating that the ion's progress in water was impeded. Al cations at 1% molar equivalent eliminated the effect in 15 min, possibly due to the production of H ions. It appeared that the low rate of drainage of the solution could have been due to an O2- Na-sulfonate linkage at the quartz/water interface and the formation of a Na alkylbenzene sulfonate-water lattice in the bulk of the solution. At the concentration used Na alkylbenzene sulfonate ion-pairs were present in the ratio of 1:38 molecules of water in a linear series, so that the formation of a lattice would seem to imply structuring of the water. Such a lattice might be destroyed by H ions. Evidence of this came first from the addition of low concentrations of H ions (2 ppm H2SO4) which eliminated the drainage effect. No effect was found in the absence of the alkyl chain, when sodium benzene sulfonate was tested. The alkyl chain is thought to act either as an intermeshing fiber or as a template to align the water molecules and facilitate the formation of bonds between them. The disappearance of the drainage rate reduction at 700 ppm Na alkylbenzene sulfonate seems to coincide with the formation of micelles. Copyright 1972, Biological Abstracts, Inc. W73-08342

#### SALT TOLERANCE OF ORNAMENTAL SHRUBS AND GROUND COVERS,

Agricultural Research Service, Riverside, Calif. Salinity Lab.

For primary bibliographic entry see Field 03C.

## Field 02—WATER CYCLE

### Group 2K—Chemical Processes

W73-08347

#### SULFIDE DETERMINATION IN SUBMERGED SOILS WITH AN ION-SELECTIVE ELECTRODE

Ministry of Agriculture, Cairo (Egypt).

A. I. Aliam, G. Pitts, and J. P. Hollis.

Soil Science, Vol 114, No 6, p 456-467, December 1972. 3 fig, 6 tab, 27 ref. NSF Grant GB-8653.

Descriptors: \*Aqueous soils, \*Hydrogen sulfide, \*Electrodes, \*Instrumentation, \*Chemical potential, Oxidation-reduction potential, Calibrations, On-site tests, Hydrogen ion concentration, Sulfides, Electrochemistry, \*Rice, \*Louisiana.

Identifiers: \*Submerged soils.

The specific silver-sulfide membrane electrode (sulfide electrode) was evaluated for measurement of the soluble sulfide levels in submerged soils 'in situ' for measuring sorption of sulfide by clay in response to sulfide concentrations, and for the testing of these observed sulfide levels against theoretical predictions. A silver sulfide electrode was used for measurement of soil sulfide levels in Louisiana rice fields. The observed potential (E) obeyed the Nernst equation as a function of sulfide ion activity or concentration. Sulfide ion concentrations could be determined by direct potentiometry or potentiometric titration. The response rate of such electrodes suggests that continuous monitoring of some changing systems is feasible. Hydrogen sulfide levels ranged from 0.00005 to 0.64128 ppm in Louisiana rice fields during the tillering and ripening stages of rice plant development. A peak of H<sub>2</sub>S accumulation coincided with the highly reduced conditions occurring at the heading-flowering stage of the rice plant. H<sub>2</sub>S levels prevalent in rice fields during the heading-flowering stage were toxic to rice plants *in vitro* and significantly higher than those predicted from chemical equilibrium theory. The two most important factors regulating H<sub>2</sub>S accumulation in Louisiana rice fields were soil pH and oxidizable carbon. H<sub>2</sub>S is removed from the soil solution by the soil clay fraction. (Knapp-USGS)

W73-08351

#### FUMAROLE WITH PERIODIC WATER FOUNTAINING, VOLCAN ALCEDO, GALAPAGOS ISLANDS

Arizona Univ., Tucson. Dept. of Geosciences.

B. E. Nordlie, and W. E. Colony.

Geological Society of America Bulletin, Vol 84, No 5, p 1709-1719, May 1973. 8 fig, 1 tab, 11 ref.

Descriptors: \*Springs, \*Volcanoes, \*Sedimentation, \*Geysers, Gases, Sands, Hydrogeology, Water chemistry.

Identifiers: \*Galapagos Islands, \*Fumaroles.

A water fountain and three associated pools are perched on the wall of the Volcan Alcedo caldera, in the Galapagos Islands, at the end of a line of active fumaroles. In July 1970, the lower basin was dry and the overflow pool was partially filled; the fountain pool was nearly full and was boiling. Gases forcefully expelled from a vent caused continuous fountaining. Opal shoreline deposits mark former maximum water levels, during which the overflow pool level is controlled by a spillway to the lower basin. The pools, full in August 1968, became completely dry by October 1970 and partially refilled in 1971. Throughout the cycle, sulfurous steam flowed from the vent. The water of the overflow pool is not in equilibrium with its deposits but is equilibrated with the atmosphere. The fountain pool shows the opposite conditions. Silica content and the location of geyserite deposits indicate that opal saturation occurs as the water cools and circulates through the overflow pool. Strata in the levee show cycles of mud, opal, and sand deposition. A sand cone is associated with the high-pressure fumarole. A turbulent gas flow velocity of about 6 m per sec would transport the sand grains. The source of water in the pools is largely meteoric. (Knapp-USGS)

W73-08377

#### CHEMICAL ANALYSES OF SELECTED PUBLIC DRINKING WATER SUPPLIES (INCLUDING TRACE METALS)

Wisconsin Dept. of Natural Resources, Madison.

For primary bibliographic entry see Field 05A.

W73-08424

#### ACETONE CONTAMINATION OF WATER SAMPLES DURING QUICKFREEZING

Maryland Univ., Solomons. Natural Resources Inst.

For primary bibliographic entry see Field 05A.

W73-08442

## 2L. Estuaries

#### SYSTEMS ENGINEERING OF OYSTER PRODUCTION

Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.

For primary bibliographic entry see Field 06C.

W73-07824

#### AN ECONOMIC APPROACH TO LAND AND WATER RESOURCE MANAGEMENT: A REPORT ON THE PUGET SOUND STUDY

Washington Univ., Seattle. Dept. of Economics.

For primary bibliographic entry see Field 06B.

W73-07826

#### EXAMINATION OF TEXTURES AND STRUCTURES MUD IN LAYERED SEDIMENTS AT THE ENTRANCE OF A GEORGIA TIDAL INLET

Skidaway Inst. of Oceanography, Savannah, Ga.

For primary bibliographic entry see Field 02J.

W73-07855

#### INTERFACE REFRACTION AT THE BOUNDARY BETWEEN TWO POROUS MEDIA

Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.

Y. Mualem.

Water Resources Research, Vol 9, No 2, p 409-414, April 1973. 5 fig, 2 tab, 4 ref.

Descriptors: \*Interfaces, \*Saturated flow, \*Hydraulic conductivity, Oil-water interfaces, Saline water-freshwater interfaces, Boundary processes, Hydrogeology, Saline water intrusion, Permeability.

Identifiers: \*Refraction (Interfaces).

In steady flow, refraction of the interface between fluids takes place at the boundary between porous layers of different hydraulic conductivities. An analytical and graphical solution of this problem is presented. The steady interface, which is a streamline, is refracted so that the ratio between the tangents of the angles that the interface makes with the normal to the surface separating the two layers equals the ratio between the corresponding hydraulic conductivities. In addition to the condition of refraction of a streamline, the angles of refraction of the interface can take only definite values depending on the slope of the boundary between the layers and the ratio of their permeabilities. Laboratory experiments, carried out on a Hele-Shaw analog, verified the analytical solution. (Knapp-USGS)

W73-07896

#### STEADY SEEPAGE FLOW TO SINK PAIRS SYMMETRICALLY SITUATED ABOVE AND BELOW A HORIZONTAL DIFFUSING INTERFACE: I. PARALLEL LINE SINKS

Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Engineering.

For primary bibliographic entry see Field 02F.

W73-07897

#### SHELF SEDIMENTS IN THE BAY OF BISCAY

Akademija Nauk SSR, Kaliningrad. Institut Okeanologii.

A. I. Blazhchishin.

Oceanology, Vol 12, No 2, p 235-246, 1972. 4 fig, 2 tab, 20 ref. Translated from Okeanologiya (USSR), Vol 12, No 2, 1972.

Descriptors: \*Oceanography, \*Marine geology, \*Continental shelf, \*Sedimentation, \*Sediments, Bottom sediments, Provenance, Sediment distribution, Sediment transport, Particle size, Geomorphology, Mineralogy, Petrography, Bedrock, Littoral, Analysis.

Identifiers: \*USSR, \*Bay of Biscay, Relict sediments, Oozes, Isobaths.

Investigations of specific lithological differences between recent and relict deposits on the continental shelf of the Bay of Biscay were based on particle-size, mineralogical, petrographic, and chemical analyses of samples of bottom sediments and bedrock collected by the 1964-68 expedition of the Atlantic Division of the Scientific Research Institute of Sea Fisheries and Oceanography. The bottom deposits identified include terrigenous (<30% CaCO<sub>3</sub>), and biogenic-calcareous (>30% CaCO<sub>3</sub>), mixed terrigenous-biocenetic sediments. Relict deposits occupy about 70% of the shelf area and are buried in different ways over wide and narrow shelves by recent sediments. The assumption that all depressions in the shelf have already been filled with sediments and that burial of adjacent relict sands is underway is confirmed by particle-size and mineral analyses. Given the low volume of incoming clastic material and the prohibitive conditions for its deposition in the northern part of the shelf, the role of biogenic calcareous sedimentation increases. (Josefson-USGS)

W73-07912

#### SOME CHARACTERISTICS OF TURBIDITY CURRENTS

Sakhalin Kompleksnyi Nauchno-Issledovatel'skii Institut, Yuzhno-Sakhalinsk (USSR).

N. L. Leonidova.

Oceanology, Vol 12, No 2, p 223-226, 1972. 1 tab, 25 ref. Translated from Okeanologiya (USSR), Vol 12, No 2, 1972.

Descriptors: \*Marine geology, \*Sedimentation, \*Sediments, \*Turbidity currents, \*Flow characteristics, Submarine canyons, Continental slope, Waves (Water), Tsunamis, Earthquakes, Energy, Kinetics, Density, Velocity, Equations.

Identifiers: \*USSR, \*Marine sediments, \*Slump (Mass movement).

Downslope flowage of unconsolidated marine sediments at the head of submarine canyons was investigated for development of turbidity currents. An estimate of the energy of these currents shows that it is comparable to that of tsunami waves observed during earthquakes. The comparable values may be further proof of the existence of dense, high-velocity turbidity flow. (Josefson-USGS)

#### THE ECOLOGY OF THE PLANKTON OF THE CHESAPEAKE BAY ESTUARY, PROGRESS REPORT DEC 1970-AUG 1972

Johns Hopkins Univ., Baltimore, Md.

For primary bibliographic entry see Field 05C.

W73-07922

#### A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. II, COMPUTATION PROCEDURES

New York City-Rand Inst., N.Y.

For primary bibliographic entry see Field 05B.

W73-07935

## WATER CYCLE—Field 02

### Estuaries—Group 2L

**DETERMINATION OF TRACE METALS AND FLUORIDE IN MINERALOGICAL AND BIOLOGICAL SAMPLES FROM THE MARINE ENVIRONMENT,**  
Naval Research Lab., Washington, D.C.  
For primary bibliographic entry see Field 05A.  
W73-07959

**DISTRIBUTION OF RADIONUCLIDES IN ORGANISMS OF MARINE FAUNA. APPLICATION OF CRITICAL CONCENTRATION FACTORS,**  
For primary bibliographic entry see Field 05B.  
W73-07966

**ACCUMULATION OF RADIONUCLIDES BY ROE AND LARVAE OF BLACK SEA FISH,**  
For primary bibliographic entry see Field 05B.  
W73-07967

**EFFECT OF INCORPORATED RADIONUCLIDES ON CHROMOSOME APPARATUS OF OCENA FISH,**  
For primary bibliographic entry see Field 05B.  
W73-07968

**RADIOECOLOGICAL STUDIES ON THE DANUBE RIVER AND ADJOINING PART OF THE BLACK SEA,**  
For primary bibliographic entry see Field 05B.  
W73-07969

**SR IN WATER OF THE CASPIAN AND AZOV SEAS,**  
For primary bibliographic entry see Field 05B.  
W73-07970

**SR90 IN AQUATIC ORGANISMS OF THE BLACK SEA,**  
For primary bibliographic entry see Field 05B.  
W73-07971

**MN, CU AND ZN IN WATER AND ORGANISMS OF THE SEA OF AZOV,**  
For primary bibliographic entry see Field 05B.  
W73-07972

**THE EFFECTS OF FLUORIDE ON ESTUARINE ORGANISMS,**  
National Inst. for Water Research, Pretoria (South Africa).  
For primary bibliographic entry see Field 05C.  
W73-08019

**PROCEEDING 1971 TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.**  
Oregon State Univ., Corvallis.  
For primary bibliographic entry see Field 05B.  
W73-08051

**VISCOELASTIC PROPERTIES OF MARINE SEDIMENTS,**  
Texas A and M Univ., College Station. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 02J.  
W73-08070

**PREDICTED EFFECTS OF PROPOSED NAVIGATION IMPROVEMENTS ON RESIDENCE TIME AND DISSOLVED OXYGEN OF THE SALT WEDGE IN THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,**  
Geological Survey, Tacoma, Wash.  
For primary bibliographic entry see Field 05B.  
W73-08084

**ATLANTIC CONTINENTAL SHELF AND SLOPE OF THE UNITED STATES—SAND-SIZE FRACTION OF BOTTOM SEDIMENTS, NEW JERSEY TO NOVA SCOTIA,**  
Geological Survey, Washington, D.C.  
J. V. A. Trumbull.

Available from GPO, Washington, D.C. 20402 - Price 55 cents (paper cover). Geological Survey Professional Paper 529-K, 1972. 45 p, 16 fig, 116 ref.

Descriptors: \*Sedimentology, \*Continental shelf, \*Atlantic Ocean, \*Northeast U.S., \*Bottom sediments, Sediment distribution, Particle size, Sands, Physical properties, Geology, Sediment transport, Erosion, Data collections, Mapping, Coasts.  
Identifiers: Sand-size fraction.

The sand-size fraction of surface sediments divides the continental shelf off the Northeastern United States into three distinctive areas: the glaciated Gulf of Maine and Nova Scotian shelf, the shallow high-energy Georges Bank-Nantucket Shoals area, and the more normal continental shelf south of New England and Long Island and east of New Jersey. The area of continental shelf under consideration is about 230,000 sq km, or about two-thirds of the area of the entire continental shelf along the east coast of the United States. Over all the continental shelf the primary components of the sand-size fraction are quartz and feldspar, with a strong admixture of rock fragments and dark minerals in the glaciated Gulf of Maine and Nova Scotian shelf, and with a variable admixture of foraminiferal tests and shell fragments. Locally, very high concentrations of glauconite are found in the bight between New Jersey and Long Island and south of Long Island. (Woodard-USGS)  
W73-08137

**SURFICIAL SEDIMENTS OF BARKLEY SOUND AND THE ADJACENT CONTINENTAL SHELF, WEST COAST VANCOUVER ISLAND,**  
British Columbia Univ., Vancouver. Dept. of Geology.  
L. Carter.  
Canadian Journal of Earth Sciences, Vol 10, No 4, p 441-459, April 1973. 13 fig, 5 tab, 36 ref.

Descriptors: \*Bottom sediments, \*Coastal plains, \*Estuaries, \*Canada, Sediment transport, Sedimentation, Pacific Ocean, Provenance, Particle size, Distribution patterns, Sands, Gravels, Muds.  
Identifiers: \*Barkley Sound (Canada).

The bathymetry and sediment distribution of Barkley Sound and the adjacent continental shelf off the west coast of Vancouver Island have been markedly affected by the late Pleistocene glaciation and modern sedimentary processes. Several fjords widen and coalesce to form the sound, which is continuous with glacially eroded basins on the inner continental shelf. These basins are flanked by flat-topped banks, the larger of which merge with the outer shelf. Modern sediments are restricted mainly to Barkley Sound where the glaciated basin and sill topography and an estuarine circulatory system prevent the detritus from reaching the continental shelf. Relict sands and gravels cover most of the shelf except within basins and drowned river valleys where muds prevail. This relict cover was initially dispersed by glaciators and meltwater streams, then later inundated during the Holocene Transgression, and is now being partly reworked by the present hydraulic regime. Near the shelf-break relict sediments are sparse; authigenic sands (glauconitized mudstone pellets) predominate together with residual sediments derived from submarine exposures of Tertiary mudstone. (Knapp-USGS)  
W73-08156

**OCEANOGRAPHIC COMMISSION,**  
Washington Natural Resources and Recreation Agencies, Olympia.  
For primary bibliographic entry see Field 06E.

W73-08199

**TIDELANDS—URGENT QUESTIONS IN SOUTH CAROLINA WATER RESOURCES LAWS,**  
South Carolina Univ., Columbia. School of Law.  
For primary bibliographic entry see Field 06E.  
W73-08201

**MARINE WASTE DISPOSAL - A COMPREHENSIVE ENVIRONMENTAL APPROACH TO PLANNING,**  
For primary bibliographic entry see Field 05B.  
W73-08247

**MIREX AND DDT RESIDUES IN WILDLIFE AND MISCELLANEOUS SAMPLES IN MISSISSIPPI - 1970,**  
Mississippi State Univ., State College. Dept. of Biochemistry.  
For primary bibliographic entry see Field 05A.  
W73-08267

**EFFECTS OF HURRICANE GINGER ON THE BARRIER ISLANDS OF NORTH CAROLINA,**  
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.  
For primary bibliographic entry see Field 02J.  
W73-08378

**AN ECOLOGICAL STUDY ON THE PROCESS OF PLANT COMMUNITY FORMATION IN TIDAL LAND, (IN KOREAN), C. S. KIM.**  
Makpo Teachers' Coll. (South Korea).

Korean J Bot. Vol 14, No 4, p 27-33, 1971. Illus. English summary.

Identifiers: Aster-Subulata, Aster-Tripolium, Atriplex-Gmelini, Chloride, Community, Cyperus-iria, Diplachne-Fusca, Echinoclocha-Hispida, Ecological studies, Formation, Limonium-Tetragramon, Plant communities, Salicornia-Herbacea, Salt, Scirpus-Maritimus, Setaria-Lutescens, Soils, Suaeda-Maritima, Succession, \*Tidal land, \*Korea.

An attempt was made to investigate the plant community structure and the process of its formation in the tidal area surrounding Makpo City (Korea); the examined area included a stand in Sam-Hak Do where sands had infiltrated the community, and a stand in Kat-Ba-Woo which had been left as tidal soil land. Two hundred stands were sampled. Frequency, cover, density, standing (g/m<sup>2</sup>), contained Cl in the soil, and pH were obtained. The rank of dominant species is Salicornia herbacea L., Suaeda maritima Dumb., Diplachne fusca L., Echinoclocha hispida Nak., Cyperus iria L., Suaeda lutescens Hubb. in Sam-Hak Do, and Suaeda maritima, E. hispida, Aster tripolium L., Scirpus maritimus L., Salicornia herbacea, D. fusca, in Kat-Ba-Woo. Among them are 5 kinds of halophytes Salicornia herbacea, Suaeda maritima, Atriplex Gmelini C. A. Mey., Aster tripolium and Limonium tetragramon Bull., and 2 kinds of naturalized plants D. fusca and Aster subulata M. In the stands from Sam-Hak Do there was evidence of secondary succession in the presence of Cyperaceae such as C. iria, Juncus decipiens Nak., and Fimbristylis longispica Stev., which could not be found in the stands from Kat-Ba-Woo. The further inland from the floodgate, the higher the number of species; that is, the lower the content of Cl, the higher the number of species. On the distribution of the vegetation; comparing DFD (Density-Frequency-Dominance) index and Cl content, the main plants are Salicornia herbacea L., Suaeda maritima Dumborties, Atriplex Gmelini, D. fusca, E. hispida where the Cl content of soil is more than 13.2%. Salicornia herbacea which has high resistance of salt, was half the total standing crop, with production of 1090/m<sup>2</sup> while Suaeda maritima was 1/4, D. fusca L. 1/8, and Echinoclocha the less than 1/8. The main factor in plant

## Field 02—WATER CYCLE

### Group 2L—Estuaries

community formation in tidal land is tolerance for Cl; a plan for utilizing the halophytes which are abundant in tidal land should be devised.—Copyright 1973, Biological Abstracts, Inc.  
W73-08403

**IDENTIFICATION OF AMAZON RIVER WATER AT BARBARDOS, WEST INDIES, BY SALINITY AND SILICATE MEASUREMENTS,**  
McGill Univ., Montreal (Quebec). Marine Sciences Centre.  
For primary bibliographic entry see Field 05B.  
W73-08430

**COMMUNITY STRUCTURE OF THE BENTHOS IN SCOTTISH SEALOCHS: I. INTRODUCTION AND SPECIES DIVERSITY,**  
Dunstnaffage Marine Research Lab., Oban (Scotland).  
For primary bibliographic entry see Field 05C.  
W73-08431

**INFECTION OF BROWN SHRIMP, PENAEUS AZTECUS IVES BY PROCHRISTIANELLA PENAEI KRUSE (CRESTODA: TRYANOPHYNCHA) IN SOUTHEASTERN LOUISIANA BAYS,**  
Nicholls State Univ., Thibodaux, La.  
For primary bibliographic entry see Field 05C.  
W73-08433

**DEVELOPMENT OF A NEW ENGLAND SALT MARSH,**  
A. C. Redfield.  
Ecol Monogr. Vol 42, No 2, p 201-237. 1972. Illus.  
Identifiers: Carbon, Geomorphology, Halophytes, Marshes, Peat, Regime, Salt marshes, Tidal marshes, Massachusetts.

The salt marsh at Barnstable, Massachusetts, occupies an embayment into which it has spread during the past 4000 yr. It exhibits all stages of development from the seedling of bare sand flats through the development of intertidal marsh, to the formation of mature high marsh underlain by peat deposits more than 20 ft deep. Observations and measurements of the stages of its formation are presented. The geomorphology of the marsh is considered in relation to the factors which have influenced its development, that is, the ability of halophytes to grow at limited tide levels, the tidal regime, the processes of sedimentation, and the contemporary rise in sea level. The rates at which the early stage of development takes place have been determined by observations during a period of 12 yr and the time sequence of earlier stages by radiocarbon analyses.—Copyright 1973, Biological Abstracts, Inc.  
W73-08443

**SPECIES DIVERSITY OF MARINE MACROBENTHOS IN THE VIRGINIA AREA,**  
Queensland Univ., Brisbane (Australia). Dept. of Zoology.

D. F. Boesch.  
Chesapeake Sci. Vol 13, No 3, p 206-211. 1972. Illus.  
Identifiers: Benthos, Diversity, Estuaries, Marine macrobenthos, Pollution, Salinity, Species, Virginia.

Species diversity of benthic macro-organisms as measured by Shannon's formula was highest on the outer continental shelf. Benthic diversity was higher in polyhaline zones of estuaries than on the shallow shelf and decreased sharply into the mesohaline zone, declining to the lowest in oligohaline zones. In addition to environmental stability and salinity regime, sediment grain size and pollution also affect species diversity. Analysis of the components of informational diversity, species richness and equitability, indicates that the

richness component accounts for most of the observed pattern, although both components are important to within-habitat differences.—Copyright 1973, Biological Abstracts, Inc.  
W73-08445

## 03. WATER SUPPLY AUGMENTATION AND CONSERVATION

### 3A. Saline Water Conversion

**BRACKISH WATER DESALINATED BY THE 'SIROTHERM' PROCESS,**  
H. A. J. Battaerd, N. V. Blesing, B. A. Bolto, A. F. G. Cope, and G. K. Stephens.  
Australian Chemical Processing and Engineering, Vol 25, No 8, p 19-21, August, 1972. 4 fig, 1 tab, 4 ref.

Descriptors: Desalination, Resins, Ion exchange, Pilot plants, Economics, Treatment facilities, Separation techniques, Water treatment, Saline water, Salinity, Water quality, Water quality control, Water supply, Australia.  
Identifiers: Sirotherm process, Resin regeneration.

The 'sirotherm' process is an Australian invention designed for the reduction of salinity of brackish waters containing up to 3000 parts per million total dissolved solids. It utilizes a mixed bed of ion exchange resins which is simply regenerated with hot water rather than with costly acid and alkali used in conventional ion exchange. A flow sheet for the operation of the process in a fixed bed is included. Although pilot plant trials of the ion exchange process have been in progress since January 1970, it will not be possible to assess the economics of the process in its various forms other than on an individual case study basis until more information becomes available on resin life pretreatment needs, and the cost of manufacturing and marketing the 'sirotherm' resin. (Smith-Texas)  
W73-07840

**DESALINIZATION PLANTS, VIRGIN ISLANDS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Department of Housing and Urban Development, San Juan, Puerto Rico. Region II.

Available from the National Technical Information Service as EIS-VI-72-5071-F, \$6.00 in paper copy, \$0.95 in microfiche. August 11, 1972. 71 p, 4 fig, 3 map.

Descriptors: Virgin Islands, Environmental effects, Desalination, Desalination plants, Water treatment, Water quality, Treatment facilities, Water supply, Water demand, Municipal water, Potable water, Industrial water, Desalination apparatus, Social aspects, Area redevelopment, Desalination wastes.  
Identifiers: Environmental Impact Statements, St. Thomas and St. Croix (Virgin Islands).

This action consists of the proposed construction of desalination plants in St. Thomas and St. Croix, Virgin Islands. Two 2,250,000 gallon per day sea water desalination plants are proposed: one on St. Thomas, adjacent to the existing generating facilities at Krum Bay and another on St. Croix, adjacent to that island's existing facilities. Neither plant will have any impact on wildlife habitat, nor influence the scenic values or land use patterns. Alternatives include the use of other locations, barging water from Puerto Rico, and no project. The only irretrievable commitment of resources involved will be the additional fuel burned by the boilers and the materials used in construction of the projects. The plants will contribute to the living standards of the population by

supplying desperately needed potable water to low-income families, residential users and commercial facilities; sustain and enhance employment opportunities for Virgin Islanders; and maintain the quality of life. The discharge of desalination wastes will have a very insignificant impact on the environment. (Mockler-Florida)  
W73-07977

### HYDROCASTING REVERSE OSMOSIS MEMBRANES,

Hydronautics, Inc., Laurel, Md.  
A. Golian, M. P. Tulin, and C. Elata.

Available from the National Technical Information Service as PB-215 035, \$3.00 in paper copy, \$1.45 in microfiche. Research and Development Progress Report No. 806, June 1972. Office of Saline Water. 204 p, 68 fig, 17 tab, 36 ref, 2 append. 14-30-2528.

Descriptors: Desalination, Reverse osmosis, Membranes, Cellulose acetate, Porosity, Nylon, Permeability.

Identifiers: Hydrocasting, Gelling solvents, Salt geling, Porous tubes, Drain casting, Polymer properties, In-situ casting, Water flux, Salt rejection.

The development of the hydrocasting method for the formation of tubular skinned reverse osmosis membranes of about 1 mm diameter (tubules) was continued. Hydrocasting in single non-porous tubes utilizing modified Loeb-Sourirajan casting solutions has been further perfected and extended to casting in multiple non-porous tubes. Various means were found effective in suppressing the undesirable macropores formed during membrane tube fabrication by hydrocasting. These improvements in membrane morphology and strength were due to: hydrocasting relatively thin membranes by casting in glass tubes of 1.5 mm I.D. or smaller; utilization of longer gas bubbles; gelling with water of lower chemical activity; and control of gelling water velocity. The way was thus opened for relatively high pressure testing (600-800 psi) of short (approx 8 in) supported sections as well as low pressure characterization (up to 220 psi) of unsupported membranes of almost full produced length (approx 30 in). The test results demonstrated that Cellulose Acetate membrane tubules of high intrinsic strength and good desalting characteristics can be produced by hydrocasting. Work on hydrocasting has been accompanied by the development of a process for the fabrication of porous nylon tubes of high water permeability and strength. This important development opens up the way for hydrocasting inside porous tubes of strength sufficient to allow relatively high internal pressure operation. The development of a drain casting method which utilizes gravity draining to cast membranes in relative large diameter (more than 1/4 in) tubes in conjunction with the development of a Multiple Tube Module, suitable for seawater operation, has also been performed. (OSW)  
W73-08185

### DEVELOPMENT OF REVERSE OSMOSIS MODULES FOR SEAWATER DESALINATION,

Gulf General Atomic Co., San Diego, Calif.  
R. L. Riley, G. R. Hightower, H. K. Lonsdale, J. F. Loos, and C. R. Lyons.

Available from the National Technical Information Service as PB-214 973, \$3.00 in paper copy, \$1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 799, July 1972. 41 p, 11 fig, 7 tab, 15 ref. 14-30-2685.

Descriptors: Reverse osmosis, Membranes, Seawater, Desalination, Ion transport.

Identifiers: Modules, Ultrathin membranes, Casting device, Composit membranes, Abrasion resistance, Flexibility, Fold resistance, Crosslinking, Porous support, Prototype unit.

## WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

### Saline Water Conversion—Group 3A

The design, fabrication, and assembly of a prototype unit for the continuous production of thin-film composite membrane support was completed. Supporting studies for assisting in the design and future operation of the casting machine were made to determine the release properties of the membrane from a number of stainless steel casting surfaces, and a method was devised for maintaining a constant level of solution within the casting knife reservoir during casting. The formation of 800-A thin films under simulated continuous-casting conditions and the casting of the membrane directly on fabric for improved strength were also examined. Studies were also begun to develop the procedures necessary to prepare spiral-wound reverse osmosis modules for seawater desalination. Module fabrication techniques were examined by preparing and reverse osmosis testing experimental modules using thin-film composite membranes. (OSW) W73-08196

#### DEVELOPMENT OF A DISPOSABLE MEMBRANE CARTRIDGE FOR REVERSE OSMOSIS DESALINATION

Amicon Corp., Lexington, Mass.  
A. S. Michaels, H. J. Bixler, R. A. Cross, D. S. Cleveland, and B. Carroll.

Available from the National Technical Information Service as PB-214 954, \$3.00 in paper copy, \$1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 795, May 1972. 50 p, 4 tab, 25 fig, 6 ref. 14-01-0001-2195.

Descriptors: \*Desalination, \*Reverse osmosis, \*Membrane processes, \*Permeability, \*Laminar flow, \*Polarization Cellulose acetate.

Identifiers: Disposal cartridge, Thin channel laminar flow, Porous supports, \*Salt rejection.

Development, design, fabrication and test are summarized of a small scale (5.5 ft<sup>2</sup> of effective membrane area) cartridge to demonstrate a practical, compact, disposable cartridge design for reverse osmosis desalination utilizing thin channel laminar flow feed stream management. In addition, a 1500 psi pressure vessel for containing the cartridge was designed, fabricated and tested together with the cartridge. (OSW) W73-08187

#### DISPOSAL OF BRINE EFFLUENTS

Dow Chemical Co., Walnut Creek, Calif.  
For primary bibliographic entry see Field 05E.  
W73-08189

#### TEMPERATURE EFFECTS ON BIOLOGICALLY INTERESTING MEMBRANE SYSTEMS

Miami Univ., Fla.

W. Drost-Hansen.

Available from the National Technical Information Service as PB-215 078, \$3.00 in paper copy, \$1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 790, August 1972. 70 p, 24 fig, 79 ref. 14-01-0001-1649.

Descriptors: \*Membranes, \*Biological membranes, Water structure, \*Interfaces, \*Membrane processes, \*Desalination, Water temperature.

Identifiers: \*Ilan membranes, Millipore membranes, Liquid membranes, Vycor membranes, Biologic potentials, Alga valonia.

The overall objective was to investigate the role of water structure, especially the structure of water near interfaces, in the properties and functioning of membranes, particularly biological membranes. It was found conceptually important to study membranes ranging from the most simple types to complex, living membranes. It was suspected and, in turn, supported by the results of the experi-

ments, that the structuring of water in or near membranes appears to play an important and, at times, dominating role in determining functional properties of membranes, regardless of the level of morphological complexity or the operational intricacies of the membranes. (OSW) W73-08190

#### TWO-STAGE FLUID TREATMENT SYSTEM

Puredesal, Inc., Levittown, Pa. (assignee).

W. E. Bradley.

U. S. Patent No. 3,707,231, 7 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 905, No 4, p 748, December 26, 1972.

Descriptors: \*Patents, Osmosis, \*Semi-permeable membranes, \*Reverse osmosis, Water treatment, Water purification, Potable water, \*Desalination, Demineralization, Saline water, Brackish water.

The two-stage fluid treatment system involves the use of two semi-permeable membranes and an intermediate fluid circulated between them. The untreated liquid is introduced to the first semi-permeable membrane which operates as a direct absorption membrane. Compaction is avoided by operating the first membrane at near zero pressure differential. The intermediate fluid is circulated rapidly on the opposite side of the first membrane and is so selected as to facilitate osmosis of the liquid to be treated. A high pressure pump transfers the intermediate fluid together with the fluid passing through the first membrane to the second membrane which is operated under reverse osmosis conditions. The second membrane is impermeable to the intermediate fluid, passes the treated fluid, while retaining the intermediate fluid which is eventually recirculated to the first membrane. (Sinha-OEIS) W73-08308

#### SUPPORT MODULE FOR REVERSE OSMOSIS MEMBRANE

Westinghouse Electric Corp., Pittsburgh, Pa. (assignee).

N. A. Salemi.

U. S. Patent No. 3,707,234, 3 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 905, No 4, p 749, December 26, 1972.

Descriptors: \*Patents, \*Reverse osmosis, Membranes, \*Semipermeable membranes, Water treatment, \*Desalination, Demineralization, Water purification.

This reverse osmosis module comprises semi-permeable tubular osmotic membranes. There is an influent conduit for supplying pressurized influent liquid to the inside of the tubular osmotic membranes. It has a conduit for draining purified liquid from the outside of the tubular osmotic membranes and a support structure for supporting the tubular osmotic membranes to prevent rupture from internal pressure. The support structure comprises plates fastened together to form a rigid stack. Each plate has holes which register with holes in adjacent plates, and the tubular osmotic membranes are disposed in these holes. Adjacent plates have sufficient spacing between them to pass liquid from the tubular osmotic membranes to the drain conduit. (Sinha-OEIS) W73-08310

#### MULTISTAGED FLASH EVAPORATOR AND A METHOD OF OPERATING THE SAME WITH SPONGE BALL DESCALING TREATMENT

Hitachi, Ltd., Tokyo (Japan). (assignee).

S. Takahashi, K. Otake, and T. Horiuchi.

U. S. Patent No. 3,707,442, 5 p, 14 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 905, No 4, p 796, December 26, 1972.

Descriptors: \*Patents, \*Flash distillation, \*Evaporators, Brine, Potable water, Distillation, Water treatment, \*Desalination, \*Descaling.

A method of operating a multistage flash evaporator has flashing chambers of successively lower pressures and temperatures. The condenser part in each chamber is composed of at least one brine tube and a flashing part. Brine is passed successively through the condensers to preheat the brine and condense steam evaporated in each flashing chamber. Brine is heated to a temperature beyond a scale ejection temperature occurring at 80°C. Sponge balls are introduced to effect continuous removal of scale attached on the inner walls of the brine tubes and brine heaters. (Sinha-OEIS) W73-08312

#### REVERSE OSMOSIS MODULE

Westinghouse Electric Corp., Pittsburgh, Pa. (assignee)

For primary bibliographic entry see Field 05D.

W73-08391

#### APPARATUS FOR PERFORMING THE IMMISCIBLE REFRIGERANT FREEZE PROCESS FOR PURIFYING WATER

United Kingdom Atomic Energy Authority, London (England). (assignee)

M. J. S. Smith, J. H. Wilson, and B. R. Part.

U. S. Patent No. 3,712,075, 5 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 906, No 4, p 1214, January 23, 1973.

Descriptors: \*Patents, \*Desalination, \*Water treatment, Sea water, \*Freezing, \*Crystallization, Separation techniques, Water purification, Brine. Identifiers: \*Ice crystals.

The immiscible refrigerant freeze process comprises boiling the immiscible refrigerant in the impure water (sea water) to be treated. The ice crystals so produced are melted to produce purified water. The apparatus has a crystallizer section with two sub-sections. The first forms a refrigerant injection zone in which ice crystal slurry is produced. The second forms a disengagement zone in which entrained refrigerant is removed from the slurry and ice crystals are allowed to grow before transferring the slurry to the brine separating and washing section. (Sinha-OEIS) W73-08392

#### REVERSE OSMOSIS MEMBRANE MODULE AND APPARATUS USING THE SAME

Aqua-Chem, Inc., Waukesha, Wis. (assignee)

G. B. Clark.

U. S. Patent No. 3,708,069, 8 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 906, No 1, p 182-183, January 2, 1973.

Descriptors: \*Patents, \*Desalination apparatus, \*Reverse osmosis, Separation techniques, \*Water treatment, Water quality control, Treatment facilities, \*Membranes.

A support is provided for a membrane in reverse osmosis equipment that need not be capable of withstanding the high pressures encountered in reverse osmosis operations. The module uses disposable tubular membranes which are arranged in conjunction with a tubular casing having substantial hoop strength. This balances out the forces due to high pressure within the casing between adjacent support tubes so that substantially all pressure is borne by the exterior casing. Each of the tubes has a discontinuous outer surface, in the shape of a hexagon, and all are held so that each tube is in contact with another tube or the interior of the casing about its entire peripheral extent. A motor driven pump within the casing receives a liquid mixture and raises its pressure to reverse osmosis operating status. The pump also drives an impeller and baffles which operate to recirculate the liquid mixture through the membrane cell. (Sinha-OEIS) W73-08397

## Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

### Group 3B—Water Yield Improvement

#### 3B. Water Yield Improvement

##### WATERSHED HYDROMETEOROLOGICAL DATA REQUIRED FOR WEATHER MODIFICATION, North American Weather Consultants, Santa Barbara, Calif.

R. D. Elliott, and J. Hannaford.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, p 61-66, 1972. 2 fig, 2 ref.

Descriptors: \*Weather modification, \*Data collections, \*Meteorological data, \*Snowpacks, \*Mountains, Meteorology, Snow surveys, Precipitation gages, Snow cover, Snowmelt, Cloud seeding.

Hydrometeorological data in five western mountain watersheds were reviewed and deficiencies in existing data required for planning of large scale research weather modification projects were noted. Ideally the additional data needed for each major watershed includes a base station for project control, several climate stations to record areal coverage of precipitation and standard meteorological parameters, and one mountain observatory unit for observation of special meteorological parameters and snow quality data. Existing data reveal little or no tendency for snowpack to level off or to decrease at higher elevations. A 10% increase in precipitation during the October through April seeding periods could increase the average annual runoff by 2.5 million acrefeet within the five large watersheds and an additional 1 million acrefeet around the periphery of these watersheds. Extending the seeding period into May and June could increase the runoff from the five study basins by 440,000 acrefeet but caution is needed in seeding during this period because of undesirable flood potentials. (See also W73-08138) (Knapp-USGS) W73-08150

##### SOUTH DAKOTA WEATHER MODIFICATION PROGRAM, South Dakota Weather Control Commission, Pierre.

M. Williams.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, p 83-88, 1972. 2 fig.

Descriptors: \*Weather modification, \*South Dakota, Cloud seeding, Research and development, Legislation, Environmental effects, Social aspects, Legal aspects.

Research efforts directed toward the development of a weather modification capability in South Dakota have been underway for approximately 10 years. An economic evaluation of the effect on crop production is under way. This involves development of a model in the form of a statistical regression to predict and detect changes in crop yield as the program progresses. Evaluation of sociological effects is a continuing part of the program. Environmental effects are also monitored. (See also W73-08138) (Knapp-USGS) W73-08154

##### WATER AND LAND RESOURCE ACCOMPLISHMENTS, 1971. Bureau of Reclamation, Washington, D.C.

For primary bibliographic entry see Field 08A. W73-08191

##### POSSIBILITY OF UTILIZING ATMOSPHERIC CONDENSATE IN THE HIGHER PLANT SYSTEM, For primary bibliographic entry see Field 02I.

W73-08345

##### THE MANAGEMENT OF MOUNTAIN CATCHMENTS BY FORESTRY, Stellenbosch Univ. (South Africa). Dept. of Silviculture.

C. L. Wicht.

S Afr For J. Vol 77, p 6-12, 1971. Illus.

Identifiers: \*Catchments, Forestry, Management, Mountain catchment, \*South Africa, \*Water conservation.

The management of mountain catchments in South Africa to maintain and improve water resources is still inadequate. The water yields from mountain areas can be strongly influenced by the control of vegetation and this is at present the only practical manner of generally increasing the basic water resources of the Republic, which are derived from precipitation. Copyright 1973, Biological Abstracts, Inc. W73-08401

##### WATER STRESS IN SALT CEDAR, Georgia Experiment Station, Experiment.

R. E. Wilkinson.

Bot Gaz. Vol 133, No 1, p 73-77, 1972. Illus.

Identifiers: Humidity, \*Salt-cedar, \*Solar radiation, Temperature, \*Water stress, Winds, Evaporation.

Salt cedar (*Tamarix pentandra* Pall.) cladophylls developed water potentials of -5 bars by early July and -20 bars by late Sept. while the plants grew in a deep sand with a high water table. Plant water utilization closely paralleled pan evaporation and solar radiation. Relative water content was correlated with season, solar radiation, air temperature, wind velocity, relative humidity, and prior growing conditions. Relative water content of trees growing on a 3-ft water table was not significantly different from the relative water content of trees growing on a water table deeper than 10ft. Relative water content decreased throughout the summer but increased in Sept. and reached 100% in mid-Oct. Copyright 1973, Biological Abstracts, Inc. W73-08422

#### 3C. Use of Water of Impaired Quality

##### EXTRAPOLATION OF INDICATOR SCHEMES WITHIN SALT MARSHES, Moskovskoe Obshchestvo Ispytatelei Prirody (USSR). Geographic Div.

For primary bibliographic entry see Field 02H. W73-07848

##### SALT TOLERANCE OF ORNAMENTAL SHRUBS AND GROUND COVERS, Agricultural Research Service, Riverside, Calif. Salinity Lab.

L. Bernstein, L. E. Francois, and R. A. Clark.

J Am Soc Hort Sci, Vol 97, No 4, p 550-556, 1972. Illus.

Identifiers: Bougainvillea, Ground covers, Guava, Holly, Injury, Leaves, Loss, Natal-Plum, \*Ornamental shrubs, Pittosporum, Rose, Rosemary, \*Salt tolerance, Shrubs, Star-Jasmine.

The salt tolerance of 25 shrub and ground-cover species was determined in plots artificially salinized with NaCl plus CaCl<sub>2</sub>. Chloride and Na injury was observed in sand cultures of the same species with 4 different salt treatments. Tolerant species, like bougainvillea, Natal plum, and rosemary were affected little, if at all, by soil salinities of 8 mmho/cm (electrical conductivity of the saturation extract: ECe), whereas sensitive species like star jasmine, guava, holly, and rose were severely damaged or killed at ECe's of 4 mmho/cm. Salt tolerance was not well correlated with injury by Cl or Na, although many species ex-

hibited leaf burn; nor was survival under highly saline conditions necessarily a good index of salt tolerance. Five-gallon specimens of sensitive, slow-growing species such as pittosporum were more tolerant than 1-gal specimens and delaying salinization of such species increased salt tolerance somewhat. Leaves with symptoms like those of Cl or of Na injury but containing very little of these ions were frequently observed in landscape plantings of a number of shrub species. The injury was attributed to inadequate watering. It is suggested that Cl or Na accumulation in leaves of shrubs may cause injury by interfering with normal stomatal closure, causing excessive water loss and leaf injury symptoms like those of drought. Copyright 1973, Biological Abstracts, Inc. W73-08347

#### 3D. Conservation in Domestic and Municipal Use

##### A MANUAL ON COLLECTION OF HYDROLOGIC DATA FOR URBAN DRAINAGE DESIGN, Hydrocomp, Inc., Palo Alto, Calif.

For primary bibliographic entry see Field 07C. W73-07801

##### REGIONAL WATER RESOURCE PLANNING FOR URBAN NEEDS: PART 1, North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.

For primary bibliographic entry see Field 06B. W73-07819

##### MODELS OF INDUSTRIAL POLLUTION CONTROL IN URBAN PLANNING, RAND Corp., Santa Monica, Calif.

For primary bibliographic entry see Field 05G. W73-07831

##### INSTANTANEOUS UNIT HYDROGRAPHS, PEAK DISCHARGES AND TIME LAGS IN URBANIZING WATERSHEDS, Purdue Univ., Lafayette, Ind. School of Civil Engineering.

For primary bibliographic entry see Field 02A. W73-07917

##### THE FINANCIAL FEASIBILITY OF REGIONALIZATION, Arkansas Univ., Fayetteville. Dept. of Agricultural Economics and Rural Sociology.

N. C. Williams, and J. M. Redfern.

Journal of the American Water Works Association, Vol 65, No 3, p 159-168, March, 1973. 1 fig, 5 tab, 12 ref.

Descriptors: \*Financial feasibility, \*Regional development, \*Water supply, \*Project planning, \*Cost analysis, Methodology, Water distribution (Applied), Water demand, Water quantity, Water users, Estimating, Return (Monetary), Rates, Amortization, Capital costs, Domestic water, Industrial water, Municipal water, Rural areas, Transmission lines, Wells, Operating costs, Governments, Human population, \*Arkansas. Identifiers: \*Regional water systems, \*Economic analysis, Incremental investment, Economics of size, Annual saving, Commercial water, Benton County, Washington County, Beaver Reservoir.

Municipal official concerned with assuring a community an adequate water supply at least cost should consider a regional water system. The feasibility of providing water on a regional basis, rather than having each municipal system augment its own supply is examined. A financially feasible project is defined as one that guarantees revenues that suffice to cover all costs, including interest on funds borrowed to finance the project. Herein, the

## WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

### Conservation in Agriculture—Group 3F

financial feasibility of supplying water from a common source in a two-county region in Arkansas in 1980 is examined. A demand model for estimating the quantity of water required by a region treats projected households as the independent variable. Two measures are used to determine the feasibility of the regional water system: (1) The rate of return on the incremental investment in the regional system is compared to the cost of capital for water systems in the area; and (2) the amortization period of a bond issue necessary to finance the project is established and compared to the productive life of the system. The rates of return calculated for the system under the anticipated demand patterns (target population projection and high population projection) exceed the cost of financing the system. (Bell-Cornell)  
W73-07919

**SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: EXPECTATION OF LIFE IN INDIANA, 1950-1970,**  
Purdue Univ., Lafayette, Ind. Dept. of Sociology and Anthropology.  
For primary bibliographic entry see Field 06B.  
W73-07964

**THE DEVELOPMENT PLAN FOR HARRISTOWN TOWNSHIP, MACON COUNTY, ILLINOIS.**  
Macon County Regional Plan Commission, Decatur, Ill.  
For primary bibliographic entry see Field 06B.  
W73-08052

**SHORELINE MANAGEMENT PLAN FOR THE ESCAMBIA-SANTA ROSA REGION.**  
Smith (Milo) and Associates, Tampa, Fla.  
For primary bibliographic entry see Field 06B.  
W73-08053

**THE INTENSITY OF DEVELOPMENT ALONG SMALL AND MEDIUM-SIZED STREAMS IN SUBURBAN PHILADELPHIA,**  
Regional Science Research Inst., Philadelphia, Pa.  
R. E. Couplin, S. Sheldon, and T. R. Hammer.  
RSRI Discussion Paper Series: No 50, September, 1971. 55 p, 8 fig, 18 tab. FWQA 16110 DYX.

Descriptors: \*Urbanization, \*Watersheds, Regression analysis, Maps, Slopes, Human population, \*Pennsylvania.  
Identifiers: \*Urban development controls, \*Philadelphia metropolitan area.

The intensity of urban development along streams in the urbanizing Philadelphia metropolitan area was studied in order to evaluate the concept and proposals that development should not be allowed along streams. The study consists of the observation of 1926 stream segments from air photographs and U.S. Geological Survey maps and an analysis of their urban intensities. The stream segments include areas 300 ft., 600 ft., and 900 ft. from the streams. Some of the findings were that all the segments were less intensely developed than the township they were located in, that about 50% of the segments had no development at all, that the larger the stream the less likely there will be development in the 300 ft. band but the more likely in the 600 ft. band, and that the development that does occur is more likely to be apartments than single family houses. Finally, a regression analysis showed that the most important variables related to intensity of development were valley slope, township population density, and watershed drainage area. (Elfers-North Carolina)  
W73-08055

**WATER SUPPLY PLANNING STUDY OF THE CAPITOL REGION OF CONNECTICUT,**  
Connecticut Univ., Storrs. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 06B.  
W73-08302

### 3E. Conservation in Industry

**SYSTEMS APPROACH TO POWER PLANNING,**  
Bechtel Corp., San Francisco, Calif. Hydro and Community Facilities Div.  
For primary bibliographic entry see Field 08C.  
W73-07925

**AGRI-INDUSTRIAL PARK WATER IMPROVEMENTS, SEWAGE TREATMENT FACILITIES, BUSINESS DEVELOPMENT LOAN (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Economic Development Administration, Austin, Tex. Southwestern Region.  
For primary bibliographic entry see Field 05D.  
W73-07978

**THE ENERGY NEEDS OF THE NATION AND THE COST IN TERMS OF POLLUTION,**  
Atomic Energy Commission, Washington, D.C.  
For primary bibliographic entry see Field 06G.  
W73-07995

**ENTROPY AS A MEASURE OF THE AREAL CONCENTRATION OF WATER-ORIENTED INDUSTRY,**  
Tennessee Univ., Knoxville. Coll. of Business Administration.  
A. S. Paulson, and C. B. Garrison.  
Water Resources Research, Vol 9, No 2, p 263-269, April, 1973. 2 tab, 5 equ, 13 ref.

Descriptors: \*Water, \*Industries, \*Areal, \*Employment, \*Entropy, \*Numerical analysis, \*Tennessee, Regional analysis, Data, Water use, Equations.  
Identifiers: \*Numbers equivalent, Water-oriented industry, Data analysis.

The concepts of entropy and numbers equivalent are applied to the configuration of water intensive and non-water intensive employment data by country in the Tennessee Valley region to provide an overall measure of the areal concentration of employment and population. If the underlying distribution of employees is assumed to be governed by the multinomial distribution, it is shown that there have been shifts in microlocal characteristics, since the role chance can play is minimal. Non-water intensive manufacturing employment has become much more areally dispersed over the study period of 1959-1968, but it appears that there has been neither a decrease nor an increase in concentration in water intensive employment. The two types of employment are concentrated to markedly different degrees. Application of the concept of entropy and numbers equivalent shows that the areal concentration of water intensive manufacturing employment in the Tennessee Valley region is substantially greater than the corresponding all-manufacturing employment. (Bell-Cornell)  
W73-08131

### 3F. Conservation in Agriculture

**ECONOMIC EVALUATION OF ALTERNATIVE FARM WATER SOURCES IN THE CLAYPAN AREA OF ILLINOIS,**  
Illinois Univ., Urbana. Dept. of Agricultural Economics.  
For primary bibliographic entry see Field 05G.  
W73-07804

**SYSTEMS ANALYSIS IN IRRIGATION AND DRAINAGE,**  
California Univ., Riverside. Dry-Lands Research Inst.

W. A. Hall.  
Journal of the Hydraulics Division American Society of Civil Engineers, Vol 99, No HY4, Proceedings paper 9639, p 567-571, April 1973. 5 p.

Descriptors: \*Irrigation, \*drainage, \*Systems analysis, \*soil moisture, Water resources, Decision making, Foods, Crops, Hydraulics, Agriculture, Plants, Nutrients, Optimization, Streamflow, Risks, Alternative planning, Mathematical models, Water rights, Water demand, Water costs, Water shortage, Salinity, Droughts, Irrigation water.  
Identifiers: Stochastic water supplies, Stochastic unregulated streamflow.

It is imperative that water engineers and planners utilize systems analysis in order that costly irreversible water decisions may be based upon sound judgments. Growing population, problems of inadequate nutrition, and rising standards of living all demand increases in food production. The rate of increasing agricultural productivity cannot be maintained by continued use of fertilizer, pest control, and genetics; only irrigation and its correlative drainage can be counted on for certain to increase food and fibre supplies. But water shortages and resulting high costs pose great difficulties. Because of such food production and water cost squeezes, and a serious political squeeze wherein potential water for agriculture is given to cities, irrigation and drainage must be brought to a point of maximum efficiency. Needed is a new technology for agricultural water use based on systems analysis, for: (1) precision control of soil moisture related factors of production; (2) optimization of the use of unregulated stochastic streamflows; (3) optimization of risk and return from water use under uncertainty; and (4) optimal salinity and drought strategies. This step must be taken, regardless of important analytical limitations and considerable additional fundamental research requirements. (Bell-Cornell)  
W73-07923

**RESEARCH NEEDS FOR IRRIGATION RETURN FLOW QUALITY CONTROL,**  
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.  
For primary bibliographic entry see Field 05G.  
W73-07965

**POLECAT BENCH AREA OF THE SHOSHONE EXTENSIONS UNIT, WYOMING.**

Hearing—Subcomm. of Water and Power Resources—Comm. on Interior and Insular Affairs, United States Senate, 92nd Cong., 2d Sess., September 19, 1972. 53 p, 1 tab.

Descriptors: \*Irrigation, \*Wyoming, \*Irrigation programs, \*Water supply development, Mississippi River Basin, Missouri River, Environmental effects, Crop production, Public benefits, Water resources development, Project planning, River basin development, Dam construction, Impoundments, Construction, Reservoirs, Wildlife conservation, Water distribution, Water management (Applied).  
Identifiers: \*Congressional hearings, Federal Water Project Recreation Act.

Testimony is reported on a bill to reauthorize the Secretary of the Interior to construct, operate and maintain the Polecat Bench area of the Shoshone extensions unit, Missouri River Basin Project, Wyoming. The development would provide irrigation water to 19,200 acres of irrigable lands and provide outdoor recreation and fish and wildlife conservation. The response from the Secretary of the Interior indicates that cost considerations are prohibitive. The State of Wyoming endorsed the

## Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

### Group 3F—Conservation in Agriculture

plan of development. By resolution the Board of Commissioners of the Polecat Bench Irrigation District, which encompasses the lands proposed for irrigation development, expressed the district's support for the development. The Wyoming Recreation Commission has requested that recreation be included as a proposed development and has indicated Wyoming's intent to comply with the provisions of the Federal Water Project Recreation Act. The project itself consists of a dam, reservoir and distribution and drainage systems. (Smith-Adam-Florida)  
W73-07985

**HYDRAULIC LABORATORY STUDIES OF A 4-FOOT-WIDE WEIR BOX TURNOUT STRUCTURE FOR IRRIGATION USE,**  
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.  
For primary bibliographic entry see Field 08B.  
W73-08086

**FOREST METEOROLOGICAL, SOIL CLIMATOLOGICAL AND GERMINATION INVESTIGATION, (IN NORWEGIAN),**  
Norske Skogforsokssvesen, Vollebekk.  
K. Bjar.

Medd Nor Skogforsokssves. Vol 28, No 8, p 429-526, 1971, Illus. (English summary).  
Identifiers: Climatology, Ecology, \*Seedling establishment, \*Forests, \*Germination, Light, Meteorology, Moisture, Soils, Temperature.

The most important aim was to reveal the ecological conditions for germination and seedling establishment. The experimental area was situated near Elverum (Norway) about 200 m above sea level. Measurements were made of groundwater level, temperature, relative air humidity, evaporation, wind speed, sunshine and soil moisture. Copyright 1972, Biological Abstracts, Inc.  
W73-08099

**SOUTH DAKOTA WEATHER MODIFICATION PROGRAM,**  
South Dakota Weather Control Commission, Pierre.  
For primary bibliographic entry see Field 03B.  
W73-08154

**WATER OF SIBERIAN RIVERS FOR ARID LANDS OF THE SOUTH (VODU SIBIRSKIKH REK—ZASUSHIVYEM ZEMLYAM YUGA),**  
For primary bibliographic entry see Field 04A.  
W73-08162

**WATER AND LAND RESOURCE ACCOMPLISHMENTS, 1971.**  
Bureau of Reclamation, Washington, D.C.  
For primary bibliographic entry see Field 08A.  
W73-08191

**SAN LUIS UNIT, CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT),**  
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.  
For primary bibliographic entry see Field 08A.  
W73-08223

**EFFECT OF WATER COMPOSITION AND FEEDING METHOD ON SOIL NUTRIENT LEVELS AND ON TOMATO FRUIT YIELD AND COMPOSITION,**  
Fora Taluntais, Dublin (Ireland).  
T. R. Gormley.  
Ir J Agric Res. Vol 11, No 1, p 101-115. 1972. Illus.  
Identifiers: \*Irrigation systems, \*Crop production, Blossoms, Conductivity, Feeding, Fruit, Methods, Nutrients, Rot, Soils, Tomato, Hydrogen ion concentration, \*Water properties.

Trickle feeding and irrigation of spring and autumn crop tomatoes grown in peat gave a lower soil pH and higher soil specific conductivity (SC) and K content than did feeding by hose or low-level sprayline methods. The use of hard water for making up feed and for irrigating gave a higher soil pH and SC than did moderately soft water. The trickle system gave the tallest plants in the autumn crop. In the spring crop plants were taller initially with the trickle system but the sprayline system gave the tallest plants later on. Hard water decreased height in both crops. Plants fed and irrigated with hard water yielded more marketable fruit in the spring crop than those treated with moderately soft water. The trickle system gave highest yields in both crops, and reduced the incidence of blossom-end rot in the spring crop. Values for fruit acidity, percentage soluble solids and K were lower in trickle tomatoes, but water type had little effect on fruit composition. Copyright 1973, Biological Abstracts, Inc.  
W73-08328

which coincided with a rapid decrease in the dry matter production rate. Stomatal closure due to water stress resulted in a greater reduction of growth rate than in transpiration. Copyright 1973, Biological Abstracts, Inc.  
W73-08328

**EFFECTS OF POLYETHYLENE MULCH ON THE CHANGE OF TOPGROWTH AND THE YIELD OF TUBERS IN RELATION TO THE RATE OF NITROGEN ABSORPTION IN SWEET POTATO (IN JAPAN),**  
Niigata Univ., Nagaoka (Japan).  
T. Morita.

Mem Fac Educ Niigata Univ. 13 p, 72-79. 1971. Illus. English summary.

Identifiers: \*Crop production, Absorption, Polyethylene, Plant growth, Moisture, \*Mulching, \*Nitrogen, Rates, Soils, \*Sweet potato, Temperature, Tuber, Weeds.

The soil beneath the polyethylene film had a lower moisture level throughout the test period in both sandy soil and clayey soil, while the soil temperature to a depth of 10 cm during the day was higher in mulched plots. In clayey soil polyethylene mulches influenced N absorption more than in unmulched plots. Furthermore, whereas little influence was observed in sandy soil, polyethylene mulch in clayey soil was beneficial in the hastening vine elongation. As a result, in clayey soil tuber root formation was favored in mulched plots due to the limited top growth during tuber formation. Polyethylene mulches in sandy soil had no influence on tuber formation or thickening. Weeding in mulched plots was markedly higher, especially in clayey soil. Copyright 1973, Biological Abstracts, Inc.  
W73-08329

**IDENTIFICATION OF A DAY OF MOISTURE STRESS IN MAIZE AT CEDARA,**  
Agricultural Research Inst., Cedara (South Africa).

For primary bibliographic entry see Field 02D.

W73-08337

**EFFECT OF A MOISTURE STRESS DAY UPON MAIZE PERFORMANCE,**  
Agricultural Research Inst., Cedara (South Africa).  
J. B. Mallett, and J. M. DeJager.

Agroplantae. Vol 3, No 2, p 15-19. 1971. Illus.

Identifiers: Grain, \*Maize, \*Moisture stress, Crop production, Crop response.

Moisture stress applied 3 wk before silking caused grain yields to be reduced by 3.2% leaf areas by 3.1% and plant height by 2.7% per day of stress. Stress applied after pollination caused yields to be reduced by 4.2% per stress day. Copyright 1972, Biological Abstracts, Inc.  
W73-08338

**EFFECT OF ORGANIC AND MINERAL FERTILIZER ON THE HYDROCHEMICAL SYSTEM OF RICE PADDIES STOCKED WITH FISH WHICH WERE EXPOSED UNDER WATER VAPOR (IN RUSSIAN),**  
For primary bibliographic entry see Field 05C.  
W73-08339

**EFFECTS OF FLOODING AND GASEOUS COMPOSITION OF THE ROOT ENVIRONMENT ON GROWTH OF CORN,**  
Illinois Univ., Urbana, Dept. of Agronomy.  
A. C. Purvis, and R. E. Williamson.

Agron J. Vol 64, No 5, p 674-678. 1972.

Identifiers: \*Plant growth, \*Soil gases, Aeration, Carbon dioxide, \*Corn, Deficiency, Drainage, Environment, Flooding, \*Gaseous composition, Injury, Oxygen, Roots.

## WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

### Control of Water on the Surface—Group 4A

The extent of root and shoot injury to corn, *Zea mays* L., plants exposed to various gaseous treatments (O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>) in the root environment and to flooding were determined from leaf area, stem diameter changes and root and shoot weights. The parameters of growth were measured before treatment, at the end of 1-, 2-, and 4-day treatments, and after a 5-day recovery period following treatment. The plants were grown in an environmental control chamber with roots of one group in an intermittent solution mist in airtight chambers and a second group in soil. When treated for 1 or 2 days with 1.0% O<sub>2</sub> with and without 20.0% CO<sub>2</sub>, the remainder being N<sub>2</sub>, only a slight reduction in growth was observed during treatment or recovery. However, treatment with this low level of O<sub>2</sub> for 4 days caused a highly significant reduction in growth during treatment and recovery. Treatments with pure N<sub>2</sub>, 21% CO<sub>2</sub> in N<sub>2</sub>, and flooding for 2 more days reduced growth during treatment and recovery considerably more than did 1% O<sub>2</sub> in N<sub>2</sub>. When these treatments lasted for 2 or more days, some of the lower leaves and a portion of the root system died. Flooding the soil caused somewhat less injury than did treatments with pure N<sub>2</sub> or 21% CO<sub>2</sub> in N<sub>2</sub>, possibly because some air was entrapped. Corn is severely injured if flooded or if the roots are in a zero O<sub>2</sub> atmosphere for more than 1 day.—Copyright 1973, Biological Abstracts, Inc.

W73-08346

#### AGRICULTURE, LAND USE, AND SMALL-HOLDER FARMING PROBLEMS IN THE SIGATOKA VALLEY,

Department of Agriculture, Suva (Fiji). Research Div.

S. Chandra.

Fiji Agric J. Vol 34, No 1, p 21-25. 1972. Illus.

Identifiers: Agriculture, \*Farming, Fiji, \*Land use, Over-population, \*Sigatoka Valley (Fiji), Valleys.

A great range of arable crops is now grown by the smallholders who work the 45 km<sup>2</sup> of Sigatoka series soils on the floodplains of the Sigatoka valley. A tentative classification of suitability of the various soil types of this series for some of the main crops is described, and compared with present actual usage. A detailed survey of 54 farms totalling 203 ha shows a dense population with a high proportion of children. Each year an increasing proportion of the farm produce must be used for home consumption leaving a very low cash income. Cropping is inefficient because the subsistence crops do not realize the full soil potential. The main barriers to development are over-population, insecurity of land tenure, slow adoption of new practices (irrigation, mechanization etc.) due to lack of capital and knowledge, and the low yield and unsuitability for summer cropping of most crop varieties now available.—Copyright 1973, Biological Abstracts, Inc.

W73-08399

#### CATTLE USE OF A SPRAYED ASPEN PARKLAND RANGE,

Centro International de Agricultura Tropical, Bogota (Colombia).

J. E. Hilton.

J Range Manage. Vol 25, No 4, p 257-260. 1972. Illus.

Identifiers: \*Aspen, Canada, \*Cattle, Forests, Grassland, \*Herbicides, Management, Parkland, *Populus-Tremuloides*, Precipitation, Range, Sprayed range.

Aspen parkland range in central Alberta that had been treated with a herbicide 2 yr before had greater grazing use of the sprayed grasslands but the difference was not as great as in the forest. During 1968 and 1969 when precipitation was heavy, the grasslands were extensively used. However, when dry conditions occurred, a greater use of the forest vegetation was observed. A regression equation was developed relating graz-

ing use to precipitation.—Copyright 1973, Biological Abstracts, Inc.

W73-08400

#### IN SITU MEASUREMENT OF ROOT-WATER POTENTIAL,

Duke Univ., Durham, N.C. Dept. of Botany.

For primary bibliographic entry see Field 021.

W73-08418

#### SOME WATER RELATIONS OF CERCOSPORELLA HERPOTRICOHOIDES,

Washington State Univ., Pullman. Dept. of Plant Pathology.

G. W. Bruehl, and J. Manandhar.

Plant Dis Rep. Vol 56, No 7, p 594-596. 1972. Illus.

Identifiers: \*Cercosporella-Herpotrichoides, Foot rot, Rot, Water temperature, Wheat, \*Winterwheat, \*Washington.

Straw breaker foot rot of winter wheat was widespread in much of eastern Washington in 1970-71, even in portions of Adams and Lincoln counties that average only 8-10 in. (20-25 cm) annual precipitation. The in vitro response of isolates of *Cercosporella herpotrichoides* from dryland and from wetter areas to water potential gave no evidence of dryland ecotypes. *C. herpotrichoides* grew on agar media amended with salts from the highest (wettest) water potential tested (-1 bar) to about -90 to -100 bars. Growth was stimulated by an osmotic water potential of about -4 to -10 bars between 1 and 25 degrees C and by -8 to -22 bars at 29 degrees. Growth was reduced to 50% of maximum at near -28 bars between 5 and 25 degrees C and at near -38 bars or lesser water potentials at 29 degrees. The slight shift in optimum water potential from wetter to drier as the temperature rises may coincide with conditions within the host.—Copyright 1973, Biological Abstracts, Inc.

W73-08421

#### THE RELATIONSHIP BETWEEN ENVIRONMENTAL FACTORS AND BEHAVIOUR OF STOMATA IN THE RICE PLANT: 2. ON THE DIURNAL MOVEMENT OF THE STOMATA (IN JAPANESE),

Tokyo Univ. of Agriculture and Technology (Japan). Faculty of Agriculture.

K. Ishihara, Y. Ishida, and T. Ogura.

Proc Crop Sci Soc Jap. Vol 40, No 4, p 497-504. 1971. Illus. English summary.

Identifiers: \*Diurnal, \*Rice, \*Stomata, Sun.

Rice grown in a submerged paddy field was much affected by weather conditions from day to day. On sunny days the aperture reached the maximum at about 8.30-9.00 a.m. and then decreased very quickly to only 1/2 or less of the maximum in the afternoon. On cloudy days the aperture increased slowly in the morning to reach the maximum at about noon and in the afternoon the aperture was wide for some time. From the tillering stage to the heading stage the maximum of the aperture per day was practically the same irrespective of weather conditions except under very low light intensity. After the heading stage the maximum per day lessened. After reaching the maximum the aperture decreased more quickly compared with before heading. The aperture decreases in the afternoon of sunny days or after heading due to the water unbalance in the leaves.—Copyright 1973, Biological Abstracts, Inc.

W73-08449

#### 04. WATER QUANTITY MANAGEMENT AND CONTROL

##### 4A. Control of Water on the Surface

###### A MANUAL ON COLLECTION OF HYDROLOGIC DATA FOR URBAN DRAINAGE DESIGN,

Hydrocomp, Inc., Palo Alto, Calif.

For primary bibliographic entry see Field 07C.

W73-07801

###### INITIAL RESULTS FROM THE UPPER WABASH SIMULATION MODEL,

Purdue Univ., Lafayette, Ind. Water Resources Research Center.

T. P. Chang, and G. H. Toebe.

Available from the National Technical Information Service as PB-219 478, \$3.00 in paper copy, \$1.45 in microfiche. Report No. 33, 1973. 89 p, 26 fig, 23 tab, append. OWRR A-016-IND (3) and A-012-IND (5).

Descriptors: \*Reservoir operation, \*Reservoir storage, \*Simulation analysis, \*Multiple-purpose reservoirs, \*Flood control, Model studies, Drainage systems, Low-flow augmentation, Recreation, Runoff, Water supply, \*Indiana.

Identifiers: \*Wabash River (Ind), Drainage-area ratio, Storage-volume ratio.

A recently built simulation model for the Upper Wabash reservoir-river system in Indiana was used to study how best to operate that system. The construction of the model and of the three daily operating policies for it (that presently employed by the Corps of Engineers, the Drainage-Area Ratio and the Storage-Volume Ratio) were outlined in two preceding reports. This report discusses results that were obtained with each of the three policies applied to various reservoir configurations having up to five reservoirs, using a variety of runoff input, and for several alternative values of official flood-stage flows. The DAR and SVR policies were both superior to that used by the Corps when the runoff was less than 10 inches. Results obtained for the addition of a small water supply demand at one reservoir indicated that small changes in the mix of project purposes require careful alteration of the operating policies throughout the system. The major conclusion was that this practical model and its operating policies can be a useful aid to design, planning and regulatory agencies.

W73-07815

###### THE MISSISSIPPI RIVER—A WATER SOURCE FOR TEXAS. (EVALUATION OF A PROPOSED WATER DIVERSION),

Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.

For primary bibliographic entry see Field 06B.

W73-07816

###### AN ECONOMIC APPROACH TO LAND AND WATER RESOURCE MANAGEMENT: A REPORT ON THE PUGET SOUND STUDY,

Washington Univ., Seattle. Dept. of Economics.

For primary bibliographic entry see Field 06B.

W73-07826

###### NATIONAL PROGRAM FOR MANAGING FLOOD LOSSES, GUIDELINES FOR PREPARATION, TRANSMITTAL, AND DISTRIBUTION OF FLOOD-PRONE AREA MAPS AND PAMPHLETS,

Geological Survey, Washington, D.C.

## Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

### Group 4A—Control of Water on the Surface

For primary bibliographic entry see Field 07C.  
W73-07849

**EUREKA—IT FITS A PEARSON TYPE 3 DISTRIBUTION,**  
Geological Survey, Washington, D.C.  
N. C. Matalas, and J. R. Wallis.  
Water Resources Research, Vol 9, No 2, p 281-289, April 1973. 8 tab, 11 ref.

Descriptors: \*Statistical methods, \*Probability, \*Streamflow forecasting, Time series analysis, Variability.  
Identifiers: \*Pearson distribution.

Under the assumption that a random variable is distributed as Pearson type 3, a comparison was made between moment and maximum likelihood estimates of the parameter values of the distribution and the variate values at specified probability levels. For the region where maximum likelihood solutions may be obtained, maximum likelihood estimates yield solutions that are less biased and less variable than the comparable moment estimates. When these results are extended to quite small samples, they become quite pronounced as the probability becomes greater than  $N/(N+1)$ . (Knapp-USGS)  
W73-07883

**APPLICATION OF NONLINEAR SYSTEM IDENTIFICATION TO THE LOWER MEKONG RIVER, SOUTHEAST ASIA,**  
Geological Survey, Menlo Park, Calif. Water Resources Div.  
S. M. Zand, and J. A. Harder.  
Water Resources Research, Vol 9, No 2, p 290-297, April 1973. 4 fig, 14 ref.

Descriptors: \*Systems analysis, \*Simulation analysis, \*Mathematical models, \*Streamflow forecasting, Synthetic hydrology, Input-output analysis, Time series analysis, Variability, Hydrograph analysis.  
Identifiers: \*Mekong River (Cambodia).

The generalized functional series representation of systems may be solved numerically by using a transformation of input that considerably reduces the computational difficulties, with a multiple-regression analysis that establishes an optimum model. Computer programs for constructing such models were applied in the construction of two models for the lower Mekong River. Both models have single outputs, the daily gage height of the river at Chaudoc, South Vietnam. One model is of the single-input type, in which the input is the net average daily discharge below Phnom Penh, Cambodia. The second model of the double-input type; it has as a second input, the daily rainfall at Takeo, Cambodia. A total of 1,497 daily measurements from January 1, 1964 to February 5, 1968, were used in the analysis. The predicting capability of the technique was tested by using the model constructed for 1,104 days as a predictor for the remaining 393 days. (Knapp-USGS)  
W73-07884

**INTRODUCTION OF TIME VARIANCE TO LINEAR CONCEPTUAL CATCHMENT MODELS,**  
Institute of Hydrology, Wallingford (England).  
For primary bibliographic entry see Field 02A.  
W73-07885

**DETERMINATION OF OPTIMAL KERNELS FOR SECOND-ORDER STATIONARY SURFACE RUNOFF SYSTEMS,**  
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 02A.  
W73-07886

**IDENTIFICATION OF MULTIPLE REACH CHANNEL PARAMETERS,**  
California Univ., Los Angeles. Dept. of Engineering Systems.  
For primary bibliographic entry see Field 02E.  
W73-07887

**APPROXIMATE SOLUTIONS FOR NON-STEADY COLUMN DRAINAGE,**  
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.  
For primary bibliographic entry see Field 02G.  
W73-07895

**MULTISITE DAILY FLOW GENERATOR,**  
Department of the Environment, Ottawa (Ontario). Water Management Service.  
For primary bibliographic entry see Field 02A.  
W73-07899

**SPRING DISCHARGE OF AN ARCTIC RIVER DETERMINED FROM SALINITY MEASUREMENTS BENEATH SEA ICE,**  
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.  
For primary bibliographic entry see Field 02C.  
W73-07900

**REGULATION OF STREAMFLOW (REGULIROVANIYE RECHNOGO STOKA),**  
Ya. F. Pleshkov.  
Gidrometeoizdat, Leningrad, 1972. 508 p.

Descriptors: \*Streamflow, \*Regulated flow, \*Regulation, \*Reservoirs, \*Reservoir operation, Reservoir storage, Reservoir releases, Reservoir yield, Flood routing, Hydrographs, Water resources, Water management (Applied), Water supply, Water utilization, Water consumption (Except consumptive use), Water loss, Water yield, Water quality control, Electric powerplants, Project planning.  
Identifiers: \*USSR, Mineralization, Nomograms.

Principles and techniques of project planning and streamflow regulation for water supply, irrigation, hydroelectric and thermal power, flood control, and other beneficial water uses are discussed. Schedules and guides for reservoir operation are developed to determine the most effective use of reservoir storage and release of stored water for conservation purposes, and changes in water-quality characteristics of reservoirs are examined from the standpoint of the protection and improvement of community water supplies. (Josephson-USGS)  
W73-07909

**WATER RESOURCES OF LAND AREAS (POMIROVANIYE RESURSOV VOD SUSHI).**  
For primary bibliographic entry see Field 02A.  
W73-07910

**OPTIMIZATION OF DEAD END WATER DISTRIBUTION SYSTEMS,**  
Roorkee Univ. (India). Dept. of Civil Engineering.  
P. K. Swamee, V. Kumar, and P. Khanna.  
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No 6E2, Proceedings paper 9650, p 123-134, April, 1973. 4 fig, 37 equ, 6 ref.

Descriptors: \*Water distribution (Applied), \*Environmental engineering, \*Optimization, \*Economics, \*Rural areas, \*Water supply, Withdrawal, Networks, Pipelines, Mathematical models, Systems analysis.  
Identifiers: Savings, Loops, Pump heads.

A single dead end system with multiple withdrawals has been synthesized. The distribu-

tion network of any water supply system involves a major portion of the total cost of the system; this portion increases with decreasing population. Dead end water distribution systems are encountered frequently in rural supply systems. Their design problem consists essentially of optimizing a nonlinear objective function subject to nonlinear constraints which are themselves functions of flow direction and therefore not uniquely definable. The solution is presented in a form directly usable by a design engineer, providing optimal pipe diameters, pumping head, hydraulic gradient line, and the minimal cost. The solution has been generalized for a continuous withdrawal of discharge. The case of two withdrawals is depicted in graphical form and provides a clear insight into the variation of the various parameters. Substantial saving can be achieved by designing the water distribution facilities at minimal costs. (Bell-Cornell)  
W73-07920

**WALKER BRANCH WATERSHED: A STUDY OF TERRESTRIAL AND AQUATIC SYSTEM INTERACTION,**  
Oak Ridge National Lab., Tenn.  
For primary bibliographic entry see Field 04D.  
W73-07947

**RECTIFICATION OF DEFICIENCIES IN COMPLETED LOCAL PROTECTION PROJECT, WELLSVILLE, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Buffalo, N.Y.  
For primary bibliographic entry see Field 08A.  
W73-07975

**BRANTLEY PROJECT, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Bureau of Reclamation, Denver, Colo.  
For primary bibliographic entry see Field 08D.  
W73-07976

**COPAN LAKE, LITTLE CANEY RIVER, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Tulsa, Okla.  
For primary bibliographic entry see Field 08A.  
W73-07979

**LOST CREEK LAKE PROJECT, ROGUE RIVER, OREGON (SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Portland, Oreg.  
For primary bibliographic entry see Field 08A.  
W73-07980

**SNAGGING AND CLEARING PROJECT ON MILL CREEK AT RIPLEY, WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as EIS-WV-72-5281-F, \$3.00 in paper copy, \$1.45 in microfiche. May 15, 1972. 12 p, 1 plate, 1 map, 1 illus.

Descriptors: \*West Virginia, \*Environmental effects, \*Flood control, \*Channel improvement, \*Flow control, Flood protection, Overflow, Surface runoff, Flood stages, Flow rates, Non-structural alternatives, Fish kill, Water pollution effects, Hydraulic structures, Stream improvement, Fisheries, Fish passages, Open channels, Banks, Channel flow, Clogging, Streamflow.  
Identifiers: \*Environmental Impact Statements, \*Mill Creek (W. Va.).

The proposed project consists of snagging and clearing of the Mill Creek channel for a distance of

## WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

### Control of Water on the Surface—Group 4A

approximately 2.5 miles downstream from Ripley, West Virginia. There is dense growth on the banks of the creek and considerable debris and fallen trees in the stream, all of which contribute to poor stream flow and chronic flooding. The city of Ripley maintains a sewage lagoon adjacent to the stream which is subject to flooding. The project is designed to reduce flood stages and flood damage at Ripley, and alleviate stream pollution by reducing the frequency of inundation of the existing sewage lagoon. Adverse environmental effects include a temporary increase in the sediment in the stream and a loss of some fish and wildlife cover along the banks of the stream. Alternatives considered included channel widening and the construction of levees. However, these measures were considered more expensive and more disruptive to the environment than the proposed project. (Adams-Florida)  
W73-07981

**POLECAT BENCH AREA OF THE SHOSHONE EXTENSIONS UNIT, WYOMING.**  
For primary bibliographic entry see Field 03F.  
W73-07985

**(ANNUAL REPORT OF THE DELAWARE RIVER BASIN COMMISSION, 1972).**  
Delaware River Basin Commission, Trenton, N.J.  
For primary bibliographic entry see Field 06E.  
W73-07990

**LIMITING FEDERAL RESERVED WATER RIGHTS THROUGH THE STATE COURTS,**  
For primary bibliographic entry see Field 06E.  
W73-07991

**WATER LAW—PRIMARY JURISDICTION OF THE BOARD OF CONTROL OVER QUESTIONS OF WATER RIGHTS.**  
For primary bibliographic entry see Field 06E.  
W73-07992

**REGULATION OF RIVERS, LAKES, AND STREAMS.**  
For primary bibliographic entry see Field 06E.  
W73-08002

**REEDS CONTROL EUTROPHICATION OF BALATON LAKE,**  
Research Inst. for Water Resources Development, Budapest (Hungary).  
For primary bibliographic entry see Field 05G.  
W73-08025

**THE PHYSIOGRAPHY AND CHARACTER OF THE SUBSTRATUM OF THE DRAINAGE AREAS OF STREAMS OF THE POLISH HIGH TATRA MOUNTAINS,**  
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.  
K. Pasternak:  
Acta Hydrobiol, Vol 13, No 4, p 363-378, 1971. Illus.  
Identifiers: Benthic animals, \*Drainage, Mountains, \*Physiography, Streams, Substratum, \*Tatra Mountains.

Important abiotic factors (relief, structure, and physico-chemical properties of the substratum) of the aqueous medium of the principal streams of the Polish High Tatra Mts. were studied. The zonal differentiation of hydrological conditions, the chemical composition of water, and the substratum of the bottom of these streams chiefly depend on the quality of the substratum of the drainage area and on climatic conditions. The shift (glacial and contemporaneous) down valleys and beds of streams of fragments of higher-lying crystalline rocks increased the range of their in-

fluence on the quality of the water and the settlement of benthic animals.—Copyright 1972, Biological Abstracts, Inc.  
W73-08039

**BOUNDARY EFFECTS ON STABILITY OF STRUCTURES,**  
Uttar Pradesh Irrigation Research Inst., Roorkee (India).  
For primary bibliographic entry see Field 06B.  
W73-08058

**TRANSPOSITION OF STORMS FOR ESTIMATING FLOOD PROBABILITY DISTRIBUTIONS,**  
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 02E.  
W73-08065

**THE APPLICATION OF SNOWMELT FORECASTING TO COMBAT COLUMBIA RIVER NITROGEN SUPERSATURATION PROBLEMS,**  
Corps of Engineers, Portland, Oreg. North Pacific Div.  
For primary bibliographic entry see Field 02C.  
W73-08142

**FORECAST STUDY FOR PRAIRIE PROVINCES WATER BOARD,**  
Water Survey of Canada, Calgary (Alberta). Alberta and Northwest Territories District Office. W. Nemanishen.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz. Printed by Colorado State University, Fort Collins, p 23-29, 1972. 3 fig, 3 tab, 8 ref.

Descriptors: \*Water yield, \*Streamflow forecasting, \*Snowmelt, Data collections, Hydrologic data, Climatic data, Meteorological data, Regional analysis, Weather data, \*Canada, Snowpacks, Snow surveys.

Identifiers: \*South Saskatchewan River.

The Prairie Provinces Water Board of western Canada initiated a study to improve and coordinate the water supply forecast for Alberta, Saskatchewan and Manitoba. Initial forecasts for the April to October period are based on winter storage precipitation data, summer rainfall, and winter base flows. The use of correction factors based on data for three integrating loss basins significantly improved the accuracy of forecast for the South Saskatchewan River. Extreme residuals were reduced from 23% to 8%. (See also W73-08138) (Knapp-USGS)  
W73-08143

**AIR TEMPERATURE OBSERVATIONS AND FORECASTS—THEIR RELATIONSHIP TO THE PREDICTION OF SPRING SNOWMELT IN THE EAGLE RIVER BASIN, COLORADO,**  
National Weather Service, Salt Lake City, Utah. River Forecast Center.  
For primary bibliographic entry see Field 02C.  
W73-08144

**WATER OF SIBERIAN RIVERS FOR ARID LANDS OF THE SOUTH (VODU SIBIRSKIKH REK—ZASUSHIVY VEMLYAM YUGA),**  
I. Geradi.  
Gidrotekhnika i Melioratsiya, No 12, p 13-23, December 1972. 1 fig, 2 tab.

Descriptors: \*Rivers, \*Arid lands, \*Diversion, \*Alteration of flow, \*Water resources development, Water utilization, Water management (Applied), Water distribution (Applied), Water control, Water supply, Water requirements, Crop production, Irrigable land, Land reclamation, Irrigation, Flooding, Projects, Planning, Feasibility studies, Forecasting.  
Identifiers: \*USSR, \*Siberia, Soviet Central Asia, Kazakhstan.

Specific measures for diversion of Siberian water to arid zones of Soviet Central Asia and Kazakhstan are outlined in a decree of the Central Committee of the Soviet Communist Party and the USSR Council of Ministers 'On Further Reclamation of Lands and Their Agricultural Use in 1971-75.' The areas involved are in the territory known as the Midland Region of the USSR, whose boundaries extend from the Urals and the Caspian Sea on the west to the Yenisey River on the east. In scale, the diversion of part of the discharge of Siberian rivers to the Midland Region would surpass anything thus far attempted anywhere in the world. Major problems that need to be resolved are the choice of places where water would be tapped from the Siberian rivers, the alignment of the diversion routes, and the economically desirable volume of water diversion. A schematic map of proposed diversion projects in the region shows existing and proposed canals, pumping stations, existing reservoirs, section of the Irtysh to be augmented by Ob' waters, and the direction of diversion. (Josephson-USGS)  
W73-08162

**DRAINAGE AREAS, HARTFORD NORTH QUADRANGLE, CONNECTICUT,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08173

**WATER, SEWER AND STORM DRAINAGE PLAN FOR THE CUMBERLAND PLATEAU PLANNING DISTRICT.**  
Thompson and Litton, Inc., Wise, Va.  
For primary bibliographic entry see Field 06D.  
W73-08179

**URBAN STORM DRAINAGE AND FLOOD CONTROL IN THE DENVER REGION—FINAL REPORT.**  
Denver Regional Council of Governments, Colo.

Final report, August 1972. 219 p, 40 tab, 25 fig.

Descriptors: \*Planning, \*Urban drainage, \*Drainage programs, \*Urbanization, \*Flood control, \*Colorado, Flood protection, Regional analysis, Drainage engineering, Storm runoff, Local governments, Administration.  
Identifiers: \*Denver (Colorado).

Realizing that urbanization affects society and the quality of life, both positively and negatively, Project REUSE (Renewing the Environment through Urban Systems Engineering) was concerned with two aspects of the urban environment in the Denver Region—storm drainage and flood control, and solid waste management. This report includes a 20-year regional program for major drainage in the study area. Included are discussions of major drainage systems, management responsibilities, criteria, assumptions and uncertainties, four alternative concepts or programs for consideration, and an evaluation of these programs. Basically, the four plans are: (1) the current 1970-1974 program, (2) master planning with initial emphasis on preventive master planning followed by design master planning, (3) master planning with construction to be implemented on a county basis as soon as masterplanning is accomplished, and (4) the same plan as item number three except that all preventive master planning would be completed by 1975. The latter is evaluated to be the best plan and costs are estimated to be more than \$8,500,000 for all planning and construction. (Poertner)  
W73-08180

## Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

### Group 4A—Control of Water on the Surface

**WATER AND LAND RESOURCE ACCOMPLISHMENTS, 1971.**  
Bureau of Reclamation, Washington, D.C.  
For primary bibliographic entry see Field 08A.  
W73-08191

**GREAT DISMAL SWAMP AND DISMAL SWAMP CANAL.**  
For primary bibliographic entry see Field 06E.  
W73-08193

**PRESERVATION AND ENHANCEMENT OF THE AMERICAN FALLS AT NIAGARA.**  
For primary bibliographic entry see Field 06G.  
W73-08194

**A SURVEY OF STATE REGULATION OF DREDGE AND FILL OPERATIONS IN NON-NAVIGABLE WATERS,**  
Florida Univ., Gainesville. School of Law.  
R. C. Ausness.  
Land and Water Law Review, Vol 8, No 1, p 65-91, 1973. 132 ref.

Descriptors: \*Legislation, \*Non-navigable waters, \*Dredging, \*Constitutional law, Eminent domain, Water law, Water policy, Legal aspects, Judicial decisions, Navigable waters, Riparian rights, Wetlands, Conservation, Protection, State jurisdiction, Maine, Massachusetts, California, Zoning, Land use, Land development, Regulation.  
Identifiers: Public trust doctrine, Nuisance (Legal aspects).

This note examines decisions arising under recently enacted state legislation regulating dredge and fill operations in certain classes of nonnavigable waters to determine the nature and extent of constitutional limitations on such regulation. Most states have used the public trust doctrine to sustain regulation over dredging and filling in navigable waters; but until lately control over such operations in non-navigable waters has been left to private remedies based upon nuisance and riparian right theories. Since dredge and fill operations frequently cause ecological harm, regulation is desirable regardless of whether or not the waters involved are navigable. Most legislation to date has been limited to coastal wetland areas, but similar legislation in landlocked areas might promote protection of water quality, conservation of fish and wildlife and flood control. Based on cases discussing the Massachusetts, Maine and California laws, protection of wetlands by regulation of dredge and fill operations has met with judicial approval, and no challenge based on a denial of due process has been successful. (Glickman-Florida)  
W73-08197

**THE WATER RESOURCES COUNCIL,**  
National Water Commission, Arlington, Va.  
For primary bibliographic entry see Field 06E.  
W73-08198

**TIDELANDS—URGENT QUESTIONS IN SOUTH CAROLINA WATER RESOURCES LAWS,**  
South Carolina Univ., Columbia. School of Law.  
For primary bibliographic entry see Field 06E.  
W73-08201

**LEGAL ASPECTS OF COASTAL ZONE MANAGEMENT IN ESCAMBIA AND SAN ROSA COUNTIES, FLORIDA (ESCAROSA).**  
For primary bibliographic entry see Field 06E.  
W73-08204

**ARTIFICIAL ADDITIONS TO RIPARIAN LAND: EXTENDING THE DOCTRINE OF ACCRETION,**  
For primary bibliographic entry see Field 06E.

W73-08206

**SMITHVILLE LAKE, LITTLE PLATTE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Kansas City, Mo.  
For primary bibliographic entry see Field 08A.  
W73-08210

**WALKER DAM IMPOUNDMENT, AQUATIC PLANT CONTROL PROJECT, NEW KENT COUNTY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Norfolk, Va.  
For primary bibliographic entry see Field 05G.  
W73-08212

**COW CREEK WATERSHED, STEPHENS AND JEFFERSON COUNTIES, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Soil Conservation Service, Washington, D.C.  
For primary bibliographic entry see Field 08A.  
W73-08214

**WILLOW ISLAND LOCKS AND DAM OHIO RIVER, OHIO AND WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Huntington, W. Va.  
For primary bibliographic entry see Field 08A.  
W73-08216

**DETAILED PROJECT REPORT, INVESTIGATION FOR FLOOD PROTECTION, MUNDAY, TEXAS, BRAZOS RIVER BASIN, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Fort Worth, Tex.  
For primary bibliographic entry see Field 08A.  
W73-08217

**KAHULUI HARBOR WEST BREAKWATER REPAIR, MAUI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.  
For primary bibliographic entry see Field 08A.  
W73-08218

**GILA RIVER BASIN, NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA, DREAMY DRAW DAM, MARICOPA COUNTY, ARIZONA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Los Angeles, Calif.  
For primary bibliographic entry see Field 08A.  
W73-08219

**T OR C WILLIAMSBURG ARROVOS WATERSHED, SIERRA COUNTY, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Soil Conservation Service, Washington, D.C.  
For primary bibliographic entry see Field 08A.  
W73-08220

**PEARL RIVER BASIN, EDINBURG DAM AND LAKE, MISSISSIPPI AND LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Mobile, Ala.  
For primary bibliographic entry see Field 08A.  
W73-08221

**KANAWHA RIVER COMPREHENSIVE BASIN STUDY, NORTH CAROLINA, VIRGINIA, AND WEST VIRGINIA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Ohio River Basin Commission, Cincinnati.

Available from the National Technical Information Service as EIS-WV-72-5581-F, \$6.75, in paper copy, \$1.45 in microfiche. Water Resources Council Report, November 1972. 92 p.

Descriptors: \*Environmental effects, \*River basin development, \*Flood protection, \*Water management (Applied), North Carolina, Virginia, West Virginia, Flood damage, Hydroelectric power, Recreation, Wildlife habitats, Water control, Flow augmentation, Aesthetics, River regulation.  
Identifiers: \*Kanawha River Basin, \*Environmental Impact Statements.

This action consists of a comprehensive study on the Kanawha River Basin in North Carolina, Virginia, and West Virginia. The study, completed by the state-federal interagency committee, recommends a comprehensive plan for the utilization of the water and related land resources of the Kanawha River Basin. The projects and programs of the comprehensive plan would provide flood damage prevention, augmentation of low flows in the stream, hydroelectric power, land treatment, National Forest development, and recreation. The proposed measures would have some adverse environmental effects including loss of free-flowing streams, loss of wildlife habitat, relocation of people and changes in stream fishery. The plan provides a framework for continuing development and management of water and related land resources in the basin, which reflects consideration of alternative means and objectives. (Mockler-Florida)  
W73-08222

**SAN LUIS UNIT, CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT),**  
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.  
For primary bibliographic entry see Field 08A.  
W73-08223

**CACHE RIVER BASIN FEATURE, MISSISSIPPI RIVER AND TRIBUTARIES PROJECT, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Memphis, Tenn.  
For primary bibliographic entry see Field 06G.  
W73-08224

**CHANGES IN THE MICROBIAL POPULATIONS OF A RESERVOIR TREATED WITH THE HERBICIDE PARAQUAT,**  
University of Wales Inst. of Science and Tech., Cardiff.  
For primary bibliographic entry see Field 05C.  
W73-08239

**AN ANALYSIS OF YEARLY DIFFERENCES IN SNOWPACK INVENTORY-PREDICTION RELATIONSHIPS,**  
Arizona Univ., Tucson. Dept. of Watershed Management.  
For primary bibliographic entry see Field 02C.  
W73-08301

**HERBACEOUS PLANT COMMUNITIES IN THE SUMMIT ZONE OF MOUNT KINABALU,**  
J. M. B. Smith.  
Malay Nat J. Vol 24, No 1, p 16-29. 1970/1971.  
Identifiers: \*Borneo, Plant communities, Floristics, Growth, \*Herbaceous plants, \*Mount Kinabalu (Borneo), Nutrients, Soils, Zones.

In North Borneo, Mount Kinabalu forms a granodiorite batholith 13,455 ft. high. The summit is cleft by a gully 4,000 ft. deep dividing Kinabalu West from Kinabalu East. A study was made of floristic, edaphic, and biotic factors; the Summit Zone is predominantly bare rock, but supports a

## WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

### Groundwater Management—Group 4B

scrubby growth wherever there is sufficient soil to support it. It is suggested that water relations are more important than the soil nutrient status for the establishment of plants. A variety of herbaceous communities appear, but none is entirely distinct; there are intermediate communities in some cases. The community categories are: bog, field layer beneath open shrub canopy, community on loose rocks of screes and landslides, rock crevice communities on open slopes, community on shallow sandy soils subject to drought and flooding, and the communities on felled sites. A table shows the herbaceous species found in 14 sites in a variety of summit zone habitats of altitudes exceeding 11,000 ft.—Copyright 1973, Biological Abstracts, Inc.  
W73-08333

**THE EFFECT OF SODIUM ALKYLBENZENE-SULPHONATE ON THE DRAINAGE OF WATER THROUGH SAND,**  
Westfield Coll., London (England). Dept. of Zoology.  
For primary bibliographic entry see Field 02K.  
W73-08342

**APPLICATION OF REMOTE SENSING TO SOLUTION OF ECOLOGICAL PROBLEMS,**  
IBM Federal Systems Div., Bethesda, Md.  
For primary bibliographic entry see Field 07B.  
W73-08358

**APPLICATIONS OF REMOTE SENSING TO STREAM DISCHARGE PREDICTION,**  
National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center.  
For primary bibliographic entry see Field 07B.  
W73-08359

**SATELLITE OBSERVATIONS OF TEMPORAL TERRESTRIAL FEATURES,**  
Allied Research Associates, Inc., Concord, Mass.  
For primary bibliographic entry see Field 07B.  
W73-08352

**INTERDISCIPLINARY APPLICATIONS AND INTERPRETATIONS OF REMOTELY SENSED DATA,**  
Pennsylvania State Univ., University Park.  
For primary bibliographic entry see Field 07B.  
W73-08363

**RIVERBED FORMATION,**  
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 07B.  
W73-08365

**GEOLOGICAL AND GEOHYDROLOGICAL STUDIES FOR ANGOSTURA DAM, CHIAPAS, MEXICO,**  
Comision Federal de Electricidad, Mexico City.  
For primary bibliographic entry see Field 08A.  
W73-08376

**A PROBABILISTIC MODEL FOR STRUCTURING A DRAINAGE NETWORK,**  
Army Project Mobile Army Sensor Systems Test Evaluation and Review Activity, Fort Hood, Tex. R. T. Robinson, and A. J. Swartz.  
Available from NTIS, Springfield, Va 22151 as AD-750 371. Price \$3.00 printed copy; \$1.45 microfiche. 1972. 14 p, 3 fig, 2 tab, 5 ref.

Descriptors: \*Geomorphology, \*Terrain analysis, \*Horn's law, \*Statistical models, \*Drainage patterns (Geologic), Stochastic processes, Probability.

A stochastic model describes the behavior of a mature drainage network in terms of four network parameters. The principal parameters are stream length ratio and bifurcation ratio. The model is amenable to computer solution and may be used to estimate the number, sizes and interfluvial distances of streams to be crossed when traversing a drainage basin, or succession of basins, with a path of varying width. Reliability of the model is materially enhanced by quantifying all four parameters within the geographical area of intended model use. However, the model reliability is little reduced if the basin shape and drainage density parameters are assumed to have equilibrium values. (Knapp-USGS)  
W73-08380

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-1970: PART 6-MISSOURI RIVER BASIN, VOLUME 4-MISSOURI RIVER BASIN BELOW NEBRASKA CITY, NEBRASKA.**  
Geological Survey, Washington, D.C. Water Resources Div.  
For primary bibliographic entry see Field 07C.  
W73-08381

**THE ECONOMICS OF WATER TRANSFER,**  
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.  
For primary bibliographic entry see Field 06B.  
W73-08387

**GREAT BASIN STATION: SIXTY YEARS OF PROGRESS IN RANGE AND WATERSHED RESEARCH,**  
W. M. Keck.  
For Serv Res Pap Int. 118, p 1-48. 1972. Illus.  
Identifiers: \*Great Basin, History, \*Range research, Utah, \*Watershed research.

A brief history is given of the Great Basin Experimental Range from its establishment in 1912 as the Utah Experiment Station. Key problems in management of watershed and rangelands and the experiments devised to solve them are described and applications of this research are indicated.—Copyright 1973, Biological Abstracts, Inc.  
W73-08398

**AGRICULTURE, LAND USE, AND SMALL-HOLDER FARMING PROBLEMS IN THE SIGATOKA VALLEY,**  
Department of Agriculture, Suva (Fiji). Research Div.  
For primary bibliographic entry see Field 03F.  
W73-08399

**THE MANAGEMENT OF MOUNTAIN CATCHMENTS BY FORESTRY,**  
Stellenbosch Univ. (South Africa). Dept. of Silviculture.  
For primary bibliographic entry see Field 03B.  
W73-08401

**FORESTS AND FLOODS IN THE EASTERN UNITED STATES,**  
Forest Service (USDA), Upper Darby, Pa. Northeastern Forest Experiment Station.  
H. W. Lull, and K. G. Reinhardt.  
US For Serv Res Pap No. Vol 226, p 1-94, 1972.  
Identifiers: Control, Cover, Erosion, \*Floods, Flow, Forestation, \*Forests, Hydrologic studies, Runoff, \*Eastern US.

A historical background is presented as a backdrop for discussion of the hydrologic processes affecting flood flows and erosion, the impact of various land uses, and the potentials for management. The forest is the best of all possible natural cover for minimizing overland flow, runoff, and erosion. The flood-reduction potential of

the forest can be realized through continued fire protection and careful logging; reforestation of abandoned land can provide additional benefits.—Copyright 1973, Biological Abstracts, Inc.  
W73-08419

**ANNUAL CYCLES OF SOIL MOISTURE AND TEMPERATURE AS RELATED TO GRASS DEVELOPMENT IN THE STEPPE OF EASTERN WASHINGTON,**  
Washington State Univ., Pullman. Dept. of Botany.  
For primary bibliographic entry see Field 02G.  
W73-08436

**AVAILABLE SOIL MOISTURE AND PLANT COMMUNITY DIFFERENTIATION IN DAVIES ISLAND, MIDDLE TENNESSEE,**  
Tennessee Technological Univ., Cookeville.  
For primary bibliographic entry see Field 02G.  
W73-08440

### 4B. Groundwater Management

**FATE OF TRACE-METALS (IMPURITIES) IN SUBSOILS AS RELATED TO THE QUALITY OF GROUND WATER,**  
Tuskegee Inst., Ala. Carver Research Foundation.  
For primary bibliographic entry see Field 05B.  
W73-07802

**THE MISSISSIPPI RIVER--A WATER SOURCE FOR TEXAS. (EVALUATION OF A PROPOSED WATER DIVERSION),**  
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 06B.  
W73-07816

**UNSTEADY FLOW TO A PARTIALLY PENETRATING, FINITE RADIUS WELL IN AN UNCONFINED AQUIFER,**  
Washington Univ., Seattle.  
For primary bibliographic entry see Field 02F.  
W73-07898

**THE TRANSIENT FLOW PROBLEM - A ONE-DIMENSIONAL DIGITAL MODEL,**  
Wyoming Univ., Laramie. Dept. of Civil and Architectural Engineering.  
For primary bibliographic entry see Field 02F.  
W73-07916

**HYDROLOGIC INVESTIGATIONS AND THE SIGNIFICANCE OF U-234/U-238 DIS-EQUILIBRIUM IN THE GROUND WATERS OF CENTRAL TEXAS,**  
Rice Univ., Houston, Tex.  
For primary bibliographic entry see Field 05B.  
W73-07949

**AGRI-INDUSTRIAL PARK WATER IMPROVEMENTS, SEWAGE TREATMENT FACILITIES, BUSINESS DEVELOPMENT LOAN (FINAL ENVIRONMENTAL IMPACT STATEMENT),**  
Economic Development Administration, Austin, Tex. Southwestern Region.  
For primary bibliographic entry see Field 05D.  
W73-07978

**HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE ARKANSAS RIVER VALLEY, BENT COUNTY, COLORADO,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08068

## Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

### Group 4B—Groundwater Management

**WATER-RESOURCES RECONNAISSANCE OF THE OZARK PLATEAU PROVINCE, NORTHERN ARKANSAS,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08069

**HYDRAULIC TESTS IN HOLE UAE-3, AMCHITKA ISLAND, ALASKA,**  
Geological Survey, Lakewood, Colo.  
W. C. Ballance.

Available from NTIS, Springfield, Va. 22151, Price \$4.00 printed copy; \$1.45 in microfiche. Geological Survey Report USGS-474-26. Revision-1 (Amchitka-17, Rev-1), April 1973. 30 p., 17 fig., 1 tab, 3 ref. AT (29-2)-474.

Descriptors: \*Aquifer testing, \*Specific capacity, Groundwater movement, Drawdown, Transmissivity, Water yield, Aquifer characteristics.  
Identifiers: \*Amchitka Island (Alaska).

During August through November 1967, the U.S. Geological Survey hydraulically tested hole UAE-3 on Amchitka Island, Alaska. Inflatable straddle packers were used to isolate and test selected intervals. Packer seats were poor in the uncased part of the hole because of unstable wall conditions, and leakage around packers occurred during some tests. However, leakage generally was slight and had little effect on the tests. The static water levels in the intervals tested ranged from 31.6 meters below land surface in the upper interval tested to about 115 meters below land surface in the lower interval tested, indicating decreasing head with depth. The relative specific capacities of isolated zones ranged from less than 0.001 cubic meter per day per meter to 0.896 cubic meter per day per meter of drawdown. (Knapp-USGS)  
W73-08071

**GEOHYDROLOGY AND ARTIFICIAL-RECHARGE POTENTIAL OF THE IRVINE AREA, ORANGE COUNTY, CALIFORNIA,**  
Geological Survey, Menlo Park, Calif. Water Resources Div.  
J. A. Singer.  
Geological Survey Water Resources Division open-file report, January 8, 1973. 41 p., 16 fig., 2 tab, 22 ref.

Descriptors: \*Hydrogeology, \*Artificial recharge, \*Coastal plains, \*Water spreading, \*California, Aquifer characteristics, Aquitards, Transmissivity, Water levels, Withdrawal, Water yield, Groundwater resources, Drawdown.  
Identifiers: \*Orange County (Calif), \*Irvine (Calif).

The Irvine area is in hydraulic continuity with the rest of the coastal plain in Orange County, California. Rapid facies change and the large percentage of silt and clay in the section locally result in confining conditions. The aquifer, most of which is included in the Fernando Formation, is as much as 1,300 feet thick beneath parts of the plain. The alluvium overlying the Fernando Formation averages about 200 feet in thickness and also contains significant amounts of silt and clay. Transmissivities range from 25,000 to 100,000 gallons per day per foot in the Irvine area, values which are much lower than those in the rest of the coastal plain in Orange County. Water levels have recovered as much as 60 feet from the low levels of the early 1950's. In the winter nonpumping season water tends to move toward upper Newport Bay and the rest of the coastal plain. During the summer pumping season a cone of depression develops, reversing the winter gradient. The average dissolved-solids content of the groundwater is about 800 milligrams per liter. The most prevalent cations are sodium and calcium; the most prevalent anions are bicarbonate and sulfate. No long-term degradation of water quality has occurred, with the exception of a slight increase in dissolved solids. No areas in the Irvine area are

suitable for the large-scale spreading of water for artificial recharge. Clay and silt predominate in the section beneath the Tustin plain, and in the foothill areas either bedrock is close to the surface or the alluvium is fine grained. (Knapp-USGS)  
W73-08072

**POLLUTION OF SUBSURFACE WATER BY SANITARY LANDFILLS, VOLUME 1,**  
Drexel Univ., Philadelphia, Pa.  
For primary bibliographic entry see Field 05B.  
W73-08073

**POSSIBLE ACCUMULATION OF AUTHIGENIC, EXPANDABLE-TYPE CLAY MINERALS IN THE SUBSTRUCTURE OF TUTLE CREEK DAM, KANSAS, U.S.A.,**  
New Mexico Univ., Albuquerque. Dept. of Geology.  
For primary bibliographic entry see Field 02K.  
W73-08093

**HEAVY METALS REMOVAL IN WASTE WATER TREATMENT PROCESSES: PART 1,**  
Orange County Water District, Santa Ana, Calif.  
For primary bibliographic entry see Field 05D.  
W73-08117

**EFFECT OF INCLUDING WATER PRICE ON THE CONJUNCTIVE OPERATION OF A SURFACE WATER AND GROUNDWATER SYSTEM,**  
Plan Organization, Tehran (Iran).  
F. Mobasher, and S. Grant.  
Water Resources Research, Vol 9, No 2, p 463-469, April, 1973. 2 fig., 17 equ., 15 ref.

Descriptors: \*Optimization, \*Water demand, \*Surface waters, \*Groundwater, \*Prices, Cost-benefit analysis, \*Operating costs, \*Water supply, Management, Equilibrium prices, Constraints, Algorithms, Mathematical models, Operations research, Computer programs, Water distribution (Applied).  
Identifiers: \*Nonlinear programming, \*Net benefits, \*Conjunctive operation, Penalty cost, Residential water.

A mathematical model is developed to study the impact of water price on residential water demand and on the conjunctive operation policy of a surface water and groundwater system. The economic objective is to maximize the present worth of net benefits from operation of the supply system. The objective function and constraints are nonlinear. A penalty cost is introduced into the objective function to take into consideration the cost of operating the system beyond the planning time horizon; the penalty cost is a function of the final groundwater state. Nonlinear programming is used to find the optimum operation strategy for the conjunctive management of the supply sources. Calculated simultaneously are the optimum demand, the distribution of supply, and the equilibrium price for each time period in the planning horizon. The model is applied to a hypothetical residential area to test the efficiency of the computer program; the planning time horizon is 25 years. (Bell-Cornell)  
W73-08132

**RENOVATING SEWAGE EFFLUENT BY GROUNDWATER RECHARGE,**  
Agricultural Research Service, Phoenix, Ariz.  
Water Conservation Lab.  
For primary bibliographic entry see Field 05D.  
W73-08141

**DISSOLVED HELIUM IN GROUNDWATER: A POSSIBLE METHOD FOR URANIUM AND THORIUM PROSPECTING,**  
McMaster Univ., Hamilton (Ontario). Dept. of Physics.  
For primary bibliographic entry see Field 02K.  
W73-08157

**RECORDS OF WELLS AND TEST BORINGS IN THE SUSQUEHANNA RIVER BASIN, NEW YORK,**  
Geological Survey, Albany, N.Y.  
For primary bibliographic entry see Field 07C.  
W73-08159

**HYDROGEOLOGY AND ENGINEERING GEOLOGY (GIDROGEOLOGIYA I INZHENERNAYA GEOLOGIYA).**  
Gornyi Institut, Leningrad (USSR).  
For primary bibliographic entry see Field 02F.  
W73-08163

**MAP SHOWING GENERAL CHEMICAL QUALITY OF GROUNDWATER IN THE SALINAQUADRANGLE, UTAH,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08172

**HYDROLOGICAL EFFECTS OF THE CANNIKIN EVENT,**  
Geological Survey, Denver, Colo.  
D. D. Gonzalez, and L. E. Wollitz.  
Bulletin of the Seismological Society of America, Vol 62, No 6, p 1527-1542, December 1972. 10 fig., 2 tab, 2 ref.

Descriptors: \*Nuclear explosions, \*Hydrogeology, Drawdown, Groundwater movement, Surface-groundwater relationships, Streamflow, Recharge, Craters, Excavation, Hydrology.  
Identifiers: \*Amchitka Island (Alaska).

The hydrological effects of the underground nuclear explosion, Cannikin, were monitored by a network of streamflow stations and groundwater boreholes located on Amchitka Island, Alaska. Continuous records were obtained from six surface-water stations that range from 1.50 to 14.07 km from surface ground zero. Confined fluid pressures in boreholes were recorded at five stations with slant distances ranging from 2.14 to 14.11 km from ground zero. Fluctuations of water level were measured in one open hole. The stream system draining the site lost 96% of its flow within hours after the explosion. Lakes formed by the explosion remain low in stage and appear to be providing infill water for the rubble chimney. Measurements in boreholes also showed that the groundwater gradient was toward the explosion site. The response of confined fluid pressures was recorded in a number of boreholes. (Knapp-USGS)  
W73-08367

**MAP SHOWING APPROXIMATE GROUNDWATER CONDITIONS IN THE PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08369

**AVAILABILITY OF GROUNDWATER, HARTFORD NORTH QUADRANGLE, CONNECTICUT,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08370

## WATER QUANTITY MANAGEMENT AND CONTROL—Field 04 Effects on Water of Man's Non-Water Activities—Group 4C

**NATURAL AND ARTIFICIAL GROUND-WATER RECHARGE, WET WALNUT CREEK, CENTRAL KANSAS,**  
Geological Survey, Lawrence, Kans.  
J. B. Gillespie, and S. E. Slagle.  
Kansas Water Resources Board Bulletin No 17, 1972. 94 p, 55 fig, 7 tab, 19 ref.

**Descriptors:** \*Groundwater resources, \*Irrigation, \*Kansas, \*Groundwater recharge, Aquifers, Aquifer characteristics, Streams, Natural recharge, Artificial recharge, Water quality, Chemical analysis, Streamflow, Water wells, Water yield, Water level fluctuations.

The withdrawal of groundwater for irrigation is accelerating rapidly in western and central Kansas. Natural recharge or artificial recharge to the aquifers is needed to ensure an adequate supply of water for the future. Wet Walnut Valley in central Kansas is a narrow alluvial valley in which an interrupted meandering stream dominates the hydrologic system. Wet Walnut Creek is generally a losing stream in most of the reach through the study area. The average annual streamflow leaving the area is 50,530 acre-feet, most of which occurs as storm runoff. Recharge to the aquifer from the losing reach of the creek during low-flow periods is only about 0.05 cubic foot per second per mile of channel because of a relatively impermeable layer of fine-grained material with an average thickness of about 2 feet that lies between the bottom of the channel and the sand and gravel of the lower alluvium. The maximum amount of water available for artificial recharge is streamflow, which averages about 50,000 acre-feet per year. The average amount probably will be less than the potential for recharge after floodwater retarding structures and artificial recharge systems have been placed in service. (Woodard-USGS)  
W73-08379

### 4C. Effects on Water of Man's Non-Water Activities

#### STORM FLOW FROM HARDWOOD-FORESTED AND CLEARED WATERSHEDS IN NEW HAMPSHIRE,

Forest Service (USDA), Durham, N.H. Northeastern Forest Experiment Station.

J. W. Hornbeck.

Water Resources Research, Vol 9, No 2, p 346-354, April 1973. 3 fig, 3 tab, 10 ref.

**Descriptors:** \*Storm runoff, \*Forest watersheds, \*Clear-cutting, \*New Hampshire, \*Rainfall-runoff relationships, Forest management, Water yield, Floods, Forests, Hydrographs, Hydrograph analysis, Demonstration watersheds.

Changes in storm flow as a result of forest clearing were determined for a small mountainous watershed in New Hampshire by using a paired watershed as a control. Reduction of transpiration and interception losses produced wetter soils with less opportunity for storing rainfall. Consequently, quick flow volumes and instantaneous peaks increased during the growing season. The absence of the hardwood forest canopy also caused earlier and more rapid snowmelt and affected most spring stormflow events involving snow water. In contrast, storm events occurring after soil moisture recharge in the fall and before the start of spring snowmelt were unaffected by forest clearing. Although changes in the spring and summer stormflow were readily detectable, their magnitude was not great. The maximum increase in individual quick flow was 30 mm for the summer streamflow season and just over 50 mm during spring snowmelt. Changes in mean quick flow were much lower. The relatively small amount of forest clearing currently taking place in New England headwaters should not increase downstream flood potential. (Knapp-USGS)

W73-07889

#### EFFECTS OF LAND USE ON WATER RESOURCES,

Federal Water Pollution Control Administration, Washington, D.C.

W. E. Bullard.

Journal of Water Pollution Control Federation, Vol 38, No 4, p 645-659, April 1966. 23 ref.

**Descriptors:** \*Watershed management, \*Water quality control, \*Surface runoff, \*Urban runoff, Sediment control, Erosion control, Nutrients, Toxins, Environmental effects, Management, Urbanization.

The basic operations of a watershed, i.e. infiltration and runoff, and the effect of various land uses on these operations, particularly in relation to water quality, are discussed. Three broad areas are identified that affect water quality: erosion and sedimentation, toxins and nutrients, and wastes. Under each of these categories and principal sources are identified, the water quality effects are discussed, and means to minimize the adverse effects are offered. In general, the problems can be broken into a non-urban versus urban dichotomy. The non-urban land uses such as agriculture, forestry, mining, and recreation can usually be handled best through improved management practices. The urban runoff problem, however, with its dirt, chemicals, oil, and nutrients from urban activities may require major treatment and storage facilities in addition to management attempts. (Elfers-North Carolina)  
W73-08054

#### THE CHANGING WATER RESOURCE,

Atmospherics, Inc., Fresno, Calif.

T. J. Henderson.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz. Printed by Colorado State University, Fort Collins, p 2-5, 1972. 2 tab.

**Descriptors:** \*Snow, \*Water resources, \*Conferences, \*Water resources development, Weather modification, Urbanization, Conservation, Water supply.

Water resources are not changing, but man's influence on this resource and his need for water are rapidly changing. The effects of man on natural patterns of water supply are usually largely inadvertent. But man's intentional activities may often improve the supply of water for either more direct benefit or improve the landscape for greater aesthetic advantage. Man has built dams, diverted large rivers, drained swamps, reclaimed deltas, developed enormous irrigation schemes, started to use saltwater conversion, and has modified the weather. (See also W73-08138) (Knapp-USGS)  
W73-08139

#### COPING WITH POPULATION GROWTH AND A LIMITED RESOURCE,

Arizona Water Commission, Phoenix.

For primary bibliographic entry see Field 06A.  
W73-08140

#### SNOW, RELATED ACTIVITIES AND CONCERN ON THE GRAND MESA, WESTERN COLORADO,

Forest Service (USDA), Delta, Colo. Grand Mesa-Uncompahgre National Forests.

For primary bibliographic entry see Field 02C.  
W73-08147

#### A WILDERNESS SNOW COURSE,

Forest Service (USDA), Kalispell, Mont. Flathead National Forest.

For primary bibliographic entry see Field 02C.  
W73-08148

#### WILDERNESS IN THE NATIONAL PARKS,

National Park Service, Denver, Colo. Denver Service Center.

J. Hennaeberger.

In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz. Printed by Colorado State University, Fort Collins, p 58-60, 1972.

**Descriptors:** \*Recreation, \*National parks, \*Recreation facilities, \*Surveys, Conservation, Planning.  
**Identifiers:** \*Wilderness areas.

A wilderness studies program has been underway in the National Park Service since 1964 when the Wilderness Act directed the Service to study all roadless areas of 5,000 acres or more in the parks and other areas of the System that existed in 1964. This would include a total of 65 areas. Public hearings have been held on 43 and up through fiscal year 1972 reports on 40 of these areas have been completed. Substantial progress on the balance has been made and completion by 1974 is anticipated. To date, Congress has created wilderness units in the Petrified Forest National Park and Craters of the Moon National Monument. (See also W73-08138) (Knapp-USGS)  
W73-08149

#### URBAN HYDROLOGY—A SELECTED BIBLIOGRAPHY WITH ABSTRACTS,

Geological Survey, Washington, D.C.

G. L. Knapp, and J. P. Glasby.

Available from the National Technical Information Service as PB-219 105, \$6.75 in paper copy, \$1.45 in microfiche. Geological Survey Water-Resources Investigations 3-72, 1972. 211 p, 651 ref.

**Descriptors:** \*Bibliographies, \*Abstracts, \*Urban hydrology, \*Urban runoff, Rainfall-runoff relationships, Storm runoff, Water pollution sources, Groundwater, Climatology, Urbanization, Cities, Urban drainage, Land use, Storm drains, Mathematical models, Suburban areas.

This bibliography of 651 selected references on urban hydrology is intended as a source document for scientific and water-management needs. It was stimulated by increasing interest in the problems of runoff and water quality caused by increasing urbanization. The bibliography brings together abstracts with citations that pertain to the rainfall-runoff process, urban groundwater problems, urban water pollution sources, urban climatic changes, and urban runoff modeling. Emphasis is given to technical advances of the past ten years as well as to needs for new research. The bibliography is arranged alphabetically by author and has separate geographic and subject indexes. Each abstract is followed by several added key words to relate it to other similar references. (USGS)  
W73-08164

#### GILA RIVER BASIN, NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA, DREAMY DRAW DAM, MARICOPA COUNTY, ARIZONA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Los Angeles, Calif.

For primary bibliographic entry see Field 08A.  
W73-08219

#### HYDROLOGICAL EFFECTS OF THE CAN-NIKIN EVENT,

Geological Survey, Denver, Colo.

For primary bibliographic entry see Field 04B.  
W73-08367

## Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

### Group 4D—Watershed Protection

#### 4D. Watershed Protection

**WALKER BRANCH WATERSHED: A STUDY OF TERRESTRIAL AND AQUATIC SYSTEM INTERACTION,**  
Oak Ridge National Lab., Tenn.  
G. S. Henderson, J. W. Elwood, W. F. Harris, H. H. Shugart, and R. L. Van Hook.  
Available from NTIS, Springfield, Va., as ORNL-4848; \$3.00 paper copy, \$1.45 microfiche. In: Environmental Sciences Division Annual Progress Report for Period Ending September 30, 1972, Report No. ORNL-4848, Feb. 1973, p 9-19, 7 fig. 3 tab.

Descriptors: \*Water resources, \*Forest watersheds, \*Biochemistry, \*Watersheds (Basins), \*Water yield, \*Ecosystems, Biological communities, Hydrology, Mineralogy, Cycles, Water quality, Aquatic populations, Comparative benefits, \*Tennessee.  
Identifiers: \*Walker Branch Watershed.

The primary objective of the Walker Branch Watershed project is quantification of biogeochemical cycles in a forested landscape. To accomplish this objective, both terrestrial and aquatic ecosystems of the watershed are being studied to (1) establish quantitative relationships between the hydrologic and mineral cycles, (2) relate water quality and aquatic productivity to characteristics of the adjacent terrestrial system, (3) provide information on natural terrestrial and aquatic system interactions for comparisons with those modified by cultural treatments, and (4) apply the knowledge gained from this small, controlled drainage basin study to broader landscape units to evaluate the impact of man's activities on the total ecosystem. (Houser-ORNL)  
W73-07947

**RECTIFICATION OF DEFICIENCIES IN COMPLETED LOCAL PROTECTION PROJECT, WELLSVILLE, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Buffalo, N.Y.  
For primary bibliographic entry see Field 08A.  
W73-07975

**ILLINOIS AND DESPLAINES RIVERS; KASKASKIA RIVER WATERSHED.**  
For primary bibliographic entry see Field 06E.  
W73-08003

**EFFECTS OF LAND USE ON WATER RESOURCES,**  
Federal Water Pollution Control Administration, Washington, D.C.  
For primary bibliographic entry see Field 04C.  
W73-08054

**BACON CREEK WATERSHED, PLYMOUTH AND WOODBURY COUNTIES, IOWA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Soil Conservation Service, Washington, D.C.  
For primary bibliographic entry see Field 08A.  
W73-08211

**VIRGINIA BEACH, VIRGINIA—BEACH EROSION CONTROL AND HURRICANE PROTECTION (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Norfolk, Va.  
For primary bibliographic entry see Field 08A.  
W73-08213

**COW CREEK WATERSHED, STEPHENS AND JEFFERSON COUNTIES, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Soil Conservation Service, Washington, D.C.  
For primary bibliographic entry see Field 08A.

W73-08214

**T OR C WILLIAMSBURG ARROYS WATERSHED, SIERRA COUNTY, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Soil Conservation Service, Washington, D.C.  
For primary bibliographic entry see Field 08A.  
W73-08220

**GREAT BASIN STATION: SIXTY YEARS OF PROGRESS IN RANGE AND WATERSHED RESEARCH,**  
For primary bibliographic entry see Field 04A.  
W73-08398

**FORESTS AND FLOODS IN THE EASTERN UNITED STATES,**  
Forest Service (USDA), Upper Darby, Pa.  
Northeastern Forest Experiment Station.  
For primary bibliographic entry see Field 04A.  
W73-08419

#### 05. WATER QUALITY MANAGEMENT AND PROTECTION

##### 5A. Identification of Pollutants

**THERMOCHEMICAL INVESTIGATION OF DIMETHYLMERCURY IN AQUEOUS AND NONAQUEOUS SOLUTIONS,**  
Missouri Univ., Rolla, Dept. of Chemistry.  
G. L. Bertrand.

Available from the National Technical Information Service as PB-219 262, \$3.00 in paper copy, \$1.45 in microfiche. Missouri Water Resources Research Center, Columbia Completion Report, 1973, 13 p, 1 fig, 4 tab, 4 ref. OWRR A-045-MO (1). 14-31-0001-3525.

Descriptors: Physicochemical properties, \*Solutions, \*Aqueous solutions, \*Mercury, Pollutant identification, Analytical techniques, Water analysis, Ions.  
Identifiers: \*Dimethylmercury, \*Thermocchemical studies.

Calorimetric investigations were made of the interactions of dimethylmercury (DMM) with various organic solvents and compounds in solution. Heats of solution of DMM in inert solvents cyclohexane and carbon tetrachloride and in active solvents benzene, pyridine, and p-dioxane were measured. The effects of nitrobenzene, thiophenol, and thiourea were also investigated. All heats of solution were endothermic and less than 0.6 kcal/mole. No indications of specific interactions were observed for any of these compounds. The apparent solubility of DMM in water and in aqueous electrolyte solutions was determined using flameless atomic absorption spectrophotometry. The term "apparent solubility" is used to specify the total concentration of all forms of mercury in an aqueous phase in prolonged contact with an excess of DMM. The solubility of DMM in pure deionized water is 3.0 micro g Hg/g water, and over the range 5-45 degrees C, Solubility (micro g Hg/g water)  $\pm$  12.7  $\exp(-1109/T)$  plus or minus 0.05. The presence of halide ions was found to greatly increase the apparent solubility of DMM, with more than a tenfold increase in 1 M NaCl. It is suspected that this increase is due to a reaction forming the more soluble methylmercury halide.  
W73-07806

**RADIOACTIVITY OF WASTE WATERS IN NUCLEAR RESEARCH INSTITUTE, REZ, AND ENVIRONMENT, (VLIV RADIOAKTIVITY OD-**

**PADNICH VOD VYZKUMNEHO JADERNEHO CENTRA V KEZI NA OKOLEJ,**  
Ceskoslovenska Akademie Ved, Rez, Ustav Jaderneho Vyzkumu.  
For primary bibliographic entry see Field 05B.  
W73-07926

**RESULTS FROM MULTI-TRACE-ELEMENT NEUTRON ACTIVATION ANALYSES OF MARINE BIOLOGICAL SPECIMENS,**  
California Univ., Irvine, Dept. of Chemistry.  
For primary bibliographic entry see Field 05C.  
W73-07927

**MONITORING OF RADIOACTIVE ISOTOPES IN ENVIRONMENTAL MATERIALS,**  
Atomic Energy of Canada Ltd., Chalk River (Ontario), Chalk River Nuclear Labs.  
W. E. Grummitt.

In: International Symposium of Identification and Measurement of Environmental Pollutants, June 14-17, 1971, Ottawa, Ontario, National Research Council of Canada, Ottawa, p 399-403, 4 fig, 3 ref.

Descriptors: \*Nuclear wastes, \*Monitoring, \*Radioisotopes, \*Gamma rays, Neutron activation analysis, Effluents, Spectroscopy, Canada, Rivers, Cobalt radioisotopes, Instrumentation, Pollutant identification, Water pollution control, Path of pollutants.

Several gamma-emitting nuclides may be identified simultaneously using a Ge (Li) detector. The background in the Co60 photopeak channel is very low. It is seldom that anything but fallout radionuclides are seen downstream in the Ottawa River; however, Co and Mn could be detected at 0.02 picoCuries/liter. To locate sources of contamination, effluents are monitored before dilution in the river. Contamination from a failed fuel rod would result in an order of magnitude higher level of neutron capture products (Mb, Mn, Sc, Fe, Zn, and Co) as compared with fission products (I131, Ba140, La140, Ru103). In purging air from water used for reactor shielding, identification was made of Ar41, Kr85, Kr87, Kr88, Xe135, Xe138, and Rb and Cs daughters. Iodine and Br radionuclides were absent. (Bopp-ORNL)  
W73-07929

**ENVIRONMENTAL MONITORING REPORT FOR THE NEVADA TEST SITE JANUARY-DECEMBER 1971.**  
National Environmental Research Center, Las Vegas, Nev.  
For primary bibliographic entry see Field 05B.  
W73-07936

**DETERMINATION OF PLUTONIUM IN ENVIRONMENTAL SAMPLES,**  
Kanazawa Univ. (Japan).  
M. Sakanoue, M. Nakaura, and T. Imai.  
In: Proceedings of an International Symposium, Rapid Methods for Measuring Radioactivity in the Environment, July 5-9, 1971, Neuherberg (Germany), p 171-181, 6 fig, 2 tab, 23 ref.

Descriptors: \*Nuclear wastes, \*Radiochemical analysis, \*Analytical techniques, \*Environmental effects, Water analysis, Sea water, Soil contamination, Sediments, Asia, Pacific Ocean, Separation techniques, Solvent extractions, Radioactivity techniques, Path of pollutants, Pollutant identification, Monitoring.  
Identifiers: Plutonium radioisotopes.

Pu239 and Sr90 in bottom sediment of Nagasaki water reservoirs are highest in those nearest the blast (100-200 picoCuries Pu239/kg). In recent coral samples from the Pacific coast, Pu239 concentration is about 2 picoCuries/kg; Pu238, about 0.8. In coastal sea water, Pu239 concentration is 0.6-0.8 picoCurie/kiloliter; Pu238, 0.1-0.5. The

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Identification of Pollutants—Group 5A

yield of radiochemical separation of Pu from the samples was determined by the addition of Pu236 tracer. The samples were extracted with triethylamine. The extract was scrubbed with nitric and hydrochloric acids, respectively, to remove U and Th. Pu was stripped by hydrofluoric acid and then electroplated onto a stainless-steel plate. The Pu isotopes were measured by alpha spectrometry. Alternate y, a rapid, semiquantitative measurement of a large number of samples is given using mica fission-track detectors in conjunction with a source of thermal neutrons. (See also W72-09437 and W72-06353.) (Bopp-ORNL) W73-07939

#### SEPARATION AND ENRICHMENT METHODS FOR MEASURING RADIOACTIVITY IN THE ENVIRONMENT, Technical Univ. of Warsaw (Pola d).

J. Minczewski.

In: Proceedings of an International Symposium, Rapid Methods for Measuring Radioactivity in the Environment, July 5-9, 1971, Neuherberg (Germany), p 57-69. 4 tab, 43 ref.

Descriptors: \*Radioisotopes, \*Radioactivity techniques, \*Solvent extractions, \*Monitoring, Analytical techniques, Separation techniques, Path of pollutants, Chromatography, Ion exchange, Pollutant identification, Nuclear wastes, Waste treatment, Radiochemical analysis, Chelation, Reviews.

A brief review is given of concentration and separation of radionuclides by precipitation, chromatography, liquid-liquid extraction and volatilization. Cs is sorbed by Cu or Zr ferrocyanide, ammonium molybdatephosphate, or sodium dipicrylamate-nitrobenzene. Cation-exchange chromatography frequently gives enrichment of one million. Anion-exchange chromatography using sorbed liquid esters is in principle a multi-stage extraction process performed continuously. To facilitate extraction, inorganic species are often complexed (1) with organic ligands or (2) with inorganic ligands which can be extracted in the form of ion pairs with a suitably large organic ion. Extraction possibilities for radionuclides with the aid of organic reagents are tabulated. (See also W72-09437 and W72-06353.) (Bopp-ORNL) W73-07940

#### RELATIVE RISKS FROM RADIONUCLIDES FOUND IN NUCLEARLY STIMULATED NATURAL GAS, Oak Ridge National Lab., Tenn.

M. J. Kelley, P. S. Rohwer, C. J. Barton, and E. G. Struxness.

Available from NTIS, Springfield, Va., as CONF. 721108-4; \$3.00 paper copy, \$1.45 microfiche. CONF. 721108-4, Nov. 1972. 27 p, 9 tab, 43 ref.

Descriptors: \*Nuclear explosions, \*Underground, \*Nuclear engineering, \*Radioactivity, \*Natural gas, \*Radioisotopes, Krypton radioisotopes, Strontium radioisotopes, Tritium, Radium radioisotopes, Air pollution, Water pollution, Public health.

Identifiers: \*Stimulation.

The risks from man-made radionuclides possibly present in nuclearly stimulated natural gas are considered in three steps: (1) radionuclides are ranked on the basis of their estimated radiation dose potentials; (2) projected doses expected to result from gas usage are compared with estimated doses from other radiation sources; and (3) risk projections for the estimated doses are compared with other risks encountered in the normal activities of life in technologically developed nations. It is prudent to assess the radiological impact of nuclear gas stimulation technology, because the results of this development could affect millions of people. Caution should be exercised in establishing acceptable concentrations of man-made radioacti-

ty in natural gas for industrial and domestic consumption. (Houser-ORNL) W73-07941

#### WATER AND WASTE WATER STUDIES, 1971 (WASSER- UND ABWASSERCHEMISCHE UNTERSUCHUNGEN), Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).

H. Guesten, W. Klug, W. Koelle, H. Rohde, and H. Ruf.

Available from NTIS, Springfield, Va., as KFK 1690 UF; \$3.00 paper copy, \$1.45 microfiche. Report KFK 1690 UF, Oct. 1972. 68 p, 19 fig, 11 tab, 24 ref.

Descriptors: \*Water pollution, \*Chlorinated hydrocarbon pesticides, \*Mercury, \*Activated carbon, Analytical techniques, Chromatography, Gas chromatography, Adsorption, Instrumentation, Pollutant identification, Organic wastes, Water quality, Water quality control, Organic loading, Solvent extractions, Halogenated pesticides, Organic pesticides, Ethers, Aromatic compounds, Rivers, Water analysis, Path of pollutants, Water treatment, Public health, Fish, Algae.

Five papers concern analytical methods for organic pollutants. Data (1970-1971) concerning the organic content of German rivers are reviewed critically. Methods described include column chromatography for various organic compounds, thin-layer chromatography for chloro-organics, and neutron-activation analysis for Hg in algae and fish. Activated carbon filters from waterworks were analyzed to give the following order of decreasing quantity for organics which had resisted biologic decomposition: chloro-organics including polychlorobiphenyls and hexachlorocyclohexane but no weed-killing agents, aromatic nitro compounds, aromatic compounds with tertiary butyl groups, esters, and ethers. A sixth paper concerns study of activated carbon in waterworks technology by its sorption-desorption characteristics for dimethylformamide. (Bopp-ORNL) W73-07944

#### CONTINUOUS MEASUREMENT OF ALPHA AND BETA RADIOACTIVITY OF WATER IN VIEW OF MAXIMUM PERMISSIBLE CONCENTRATIONS FOR THE PUBLIC, Commissariat a l'Energie Atomique, Saclay (France).

J. Matutano, P. Hory, and L. Girvaud.

Available from NTIS, Springfield, Va., as CEA-CONF-2007; \$3.00 per copy, \$1.45 microfiche. Report CEA-CONF-2007, March 1972. 11 p, 7 fig, 1 tab.

Descriptors: \*Radioactivity, \*Measurement, \*Nuclear powerplants, \*Effluents, \*Assay, \*Radioisotopes, Lakes, Fish, Regulation, Potable water, Monitoring, Evaporation, Equipment, Aerosols, Filtration, Analytical techniques, Efficiencies.

Identifiers: \*France.

Some liquid effluents from the CNEN-Saclay were put into the Saclay lakes which contain large quantities of fish. The radioactivity level was measured to be less than or equal to the maximum permissible concentrations of drinking water. A detector consisting of two flow counter which operates as a proportional counter was developed for the continuous measurement of the activity (10 to the minus 6th power to 10 to the minus 8th power) of liquid effluents. The equipment used in the measurements concentrates the radioactivity of a volume of water by evaporation. The evaporation is effected by the atomization of the water in a hot air flow; the dry aerosol is recovered using air filtration. The efficiency and performance of the apparatus are given. (Houser-ORNL) W73-07945

#### FALLOUT PROGRAM QUARTERLY SUMMARY REPORT, SEPTEMBER 1, 1972 - DECEMBER 1, 1972, New York Operations Office (AEC), N.Y. Health and Safety Lab.

E. P. Hardy, Jr.

Available from NTIS, Springfield, Va., as HASL-268; \$3.00 per copy, \$1.45 microfiche. Report No. HASL-268, Jan. 1, 1973. 179 p, 8 fig, 25 tab, 19 ref, 6 append.

Descriptors: \*Fallout, \*Radioactivity, \*Monitoring, \*Measurement, \*Assay, Sampling, Analytical techniques, Radiochemical analysis, Data collections, Atlantic Ocean, Strontium, Tritium, Food chains, Public health, Bibliographies, Publications.

Current data are presented from the HASL Fallout Program; the National Radiation Laboratory in New Zealand, and the EURATOM Joint Nuclear Research Centre at Ispra, Italy. Interpretive reports are presented on strontium-90 fallout over the Atlantic, fallout tritium and dose commitment, and quality control analyses of surface air, fallout, diet, and bone analyses during 1971. Tabulations of radionuclide levels in fallout, surface air, stratospheric air, milk, and tap water are included. A bibliography of recent publications related to radionuclide studies, is also presented. (See also W73-07951) (Houser-ORNL) W73-07950

#### APPENDIX TO QUARTERLY SUMMARY REPORT, SEPT. 1, 1972, THROUGH DEC. 1, 1972 HEALTH AND SAFETY LABORATORY, FALLOUT PROGRAM, New York Operations Office (AEC), N.Y. Health and Safety Lab.

E. P. Hardy, Jr.

Available from NTIS, Springfield, Va., as HASL-268, Appendix; \$3.00 per copy, \$1.45 microfiche. Report No. HASL-268, Appendix, Jan. 1, 1973. 448 p, 6 Append.

Descriptors: \*Fallout, \*Data collections, \*Sampling, \*Assay, \*Strontium, \*Food chains, \*Population, Public health, Air pollution, Water pollution, Atlantic Ocean, Lead, Milk, Domestic water.

Presents fallout data in the following six appendices: (A) Strontium in Monthly Deposition at World Land Sites; (B) Radiostrontium Deposition at Atlantic Ocean Weather Stations; (C) Radionuclides and Lead in Surface Air; (D) Radiostrontium in Milk and Tap Water, (E) Table of Conversion Factors, and (F) Table of Radionuclides. (See also W73-07950) (Houser-ORNL) W73-07951

#### ENVIRONMENTAL RADIOACTIVITY IN GREENLAND IN 1971, Danish Atomic Energy Commission, Risoe. Health Physics Dept.

For primary bibliographic entry see Field 05B.

W73-07953

#### DETERMINATION OF TRACE METALS AND FLUORIDE IN MINERALOGICAL AND BIOLOGICAL SAMPLES FROM THE MARINE ENVIRONMENT,

Naval Research Lab., Washington, D.C.

D. J. Bressan, R. A. Carr, P. J. Hannan, and P. E. Wilkins.

Available from NTIS, Springfield, Va., as CONF. 721010-8; \$3.00 paper copy, \$1.45 microfiche. Report CONF-721010-8, 1972. 10 p, 4 tab, 10 ref. From International Conference on Modern Trends in Activation Analysis, Oct. 2, 1972, Saclay, France.

Descriptors: \*Neutron activation analysis, \*Mercury, \*Marine algae, \*Air pollution, Dusts,

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5A—Identification of Pollutants

Oceans, Water pollution sources, Gamma rays, Spectroscopy, Path of pollutants, Fluorides, Absorption, Trace elements, Tracers, Analytical techniques, Food chains.

Hg or its volatile compounds must condense on atmospheric particles or react with them, since neutron-activation analysis shows that Hg is about two orders of magnitude higher in over-ocean dust than the average in the earth's crust. That the atmospheric dust is of continental origin is suggested by higher F (330-875 ppm) than for sea salt (37 ppm) as determined by neutron-activation analysis and other methods. The neutron activation technique for analysis of Hg in marine algae was checked by atomic absorption spectroscopy. Carrier-free Hg197, produced by irradiation of gold targets, was used in determining Hg uptake by marine algae at varying Hg concentrations in the water. (Bopp-ORNL)  
W73-07959

#### BACTERIAL AND ALGAL CHLOROPHYLL IN TWO SALT LAKES IN VICTORIA, AUSTRALIA,

S. U. Hussainy.  
Water Research, Vol 6, No 11, p 1361-1365, November 1972. 3 fig, 1 tab, 15 ref.

Descriptors: \*Water analysis, \*Chlorophyll, \*Algae, \*Bacteria, \*Dissolved solids, Distribution patterns, Australia, Optical properties, Separation techniques, Saline lakes.

Identifiers: \*Optical density, \*Grammetric analysis, Lake Keiambete, Lake Gnotuk.

Water samples were collected at depths of 1, 2, 3, 5, 10, and 20 m from Lake Gnotuk and at 10 m from Lake Keiambete (Australia) and analyzed for total dissolved solids, algal chlorophyll, and bacterial chlorophyll. Solids were estimated gravimetrically; algal chlorophyll was determined by filtering the sample, extracting with acetone, and recording the optical density; bacterial chlorophyll was estimated by applying a provisional equation derived by Takahashi and Ichimura to the optical density data. Total dissolved solids concentrations were 59.3 and 60.2 g per l for Lakes Keiambete and Gnotuk, respectively. The standing crops of autotrophic sulphur bacteria in terms of bacterial chlorophyll were found to be in larger quantities than algal chlorophyll a. Both at the surface and at the bottom, bacterial chlorophyll a was about ten times as much as algal chlorophyll a. Their population in smaller quantities at other depths may be due to the heavy grazing by the zooplankton. It is suggested that the bacteria may be a good food source for the zooplankton. It is also suggested that the deep orange pigmentation in the Copepoda may be due to their grazing on the pink bacteria. (Little-Battelle)  
W73-08018

#### THE USE OF AGAR DIP-SLIDES FOR ESTIMATES OF BACTERIAL NUMBER IN POLLUTED WATERS,

Nairobi Univ. (Kenya). Dept. of Civil Engineering, D. D. Mara.  
Water Research, Vol 6, No 12, p 1605-1607, December 1972. 2 fig, 1 tab, 3 ref.

Descriptors: \*Sewage bacteria, \*Aquatic bacteria, \*Monitoring, \*Estimating, Water pollution, Sewage, Methodology, Pollutant identification.

Identifiers: \*Agar dip-slides, Culture media, Agars, Plate counts.

Oxoid and 'Uricult' agar dip-slides were used to estimate to the nearest order of magnitude total and coliform counts in sewage and polluted rivers. Samples of sewage and polluted river water were collected in sterile 8-oz (228-ml) bottles. Standard plate counts were obtained in Oxoid yeast extract agar after 24 h incubation at 35 degrees C. Total coliform and faecal coliform pour-plate counts

were obtained in lactose teepol agar (Jameson and Emberley, 1956) after 4 h incubation at 30 degrees C followed 18-20 h at either 35 degrees or 44 degrees C (Mara, in preparation). These counts were used to judge the accuracy of the dip-slide counts. Two Oxoid dip-slides were immersed in the sewage or river flow for ca. 5 s and incubated, one at 35 degrees C and the other 44 degrees C for 20-24 h. At some sampling stations 'Uricult' dip-slides (Orion Pharmaceutical, Helsinki) were also used. These estimates agreed closely with the corresponding pour-plate counts in yeast extract agar and lactose teepol agar. The dip-slide technique is simple and suitable for routine monitoring of effluent quality and river pollution. (Holoman-Battelle)  
W73-08021

#### A NEW SIMPLE WATER FLOW SYSTEM FOR ACCURATE CONTINUOUS FLOW TESTS,

Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).

For primary bibliographic entry see Field 07B.

W73-08022

#### A SIMPLE METHOD FOR CONCENTRATING AND DETECTING VIRUSES IN WASTEWATER,

Central Public Health Engineering Research Inst., Nagpur (India).

V. C. Rao, U. Chandorkar, N. U. Rao, P.

Kurmaran, and S. B. Lakhe.

Water Research, Vol 6, No 12, p 1565-1576, December, 1972. 1 fig, 13 tab, 11 ref.

Descriptors: \*Waste water (Pollution), \*Isolation, \*Methodology, \*Viruses, Sewage, Sewage effluents, Hydrogen ion concentration, Laboratory equipment, Biochemical oxygen demand, Pollutant identification, Efficiencies, Sampling, Cultures.

Identifiers: \*Sample preparation, Recovery, \*Membrane filters, Poliovirus type I, Coxsackie virus B3, Coxsackie virus B5, Echo virus 9, Tissue culture, Elution, Enteroviruses.

A simple method has been developed for routine analysis of sewage effluents for detecting viruses using adsorption at pH 3 on a 0.45-micron 47-mm diameter membrane filter and elution at pH 8. It was tested on viruses added to autoclaved sewage. Homogenizing the sample for 4 min in a Waring blender and clarification by centrifugation at 1800 g and later at 9230 g facilitated easy filtration without any loss of virus. Retention of the eluent for 30 min on the millipore membrane and then elution in situ under suction provided a sterile eluate with 100 per cent recovery of viruses. Viruses added to fecal suspensions with 600 mg/l BOD were completely recovered when the sample pH was adjusted to 3 and its salt concentration increased by adding 1200 mg/l of Mg (2+) as the chloride. This procedure eliminated the need for passing the samples through ion exchange resins for removing membrane coating components. In a 1 yr program of monitoring of raw sewage from a middle income group community in Nagpur, a maximum of 3150 PFU/l during monsoon and 11575 PFU/l during winter was obtained. High efficiency and reproducibility of the method allowed the use of sample volumes of 40 ml of raw sewage and 320 ml of treated effluent for the detection of viruses. (Holoman-Battelle)  
W73-08023

#### WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS: A PROGRESS REPORT,

National Sanitation Foundation, Ann Arbor, Mich.

N. I. McClelland, and K. H. Mancy.

Journal of the American Water Works Association, Vol 64, No 12, p 795-803, December, 1972. 21 fig, 4 tab, 3 ref.

Descriptors: \*Potable water, \*Monitoring, \*Instrumentation, \*Water temperature, \*Dissolved oxygen, \*Hydrogen ion concentration, \*Conductivity, \*Hardness, \*Chlorides, \*Flourides, \*Turbidity, \*Alkalinity, \*Nutrients, Nitrates, Chlorine, Copper, Cadmium, Lead, Corrosion, Scaling, Water analysis, Electrical equipment, Research equipment, Sampling, Calibrations, Calcium carbonate, Water quality.

Identifiers: \*Heavy metals, Ion selective electrodes, Nephelometers, Galvanic cells, Anodic stripping voltammetry, Membrane electrodes, Sample preparation, Residual chlorine, Glass electrodes, Differential anodic stripping voltammetry.

The progress of the Water Quality Monitoring Project which is being conducted by the National Sanitation Foundation is reviewed. A prototype potable water quality monitor is on-stream and can measure: temperatures using thermistors; DO with a voltammetric membrane electrode; pH with a glass electrode; conductivity with an a-c conductivity cell; hardness, nitrates, chlorides, and fluorides with ion-selective electrodes; turbidity with a nephelometer; free residual chlorine with a galvanic cell; alkalinity with a glass electrode; Cu by anodic stripping voltammetry; Cd and Pb by differential anodic stripping voltammetry; and corrosion by a polarization admittance technique. Sample analyses for hardness, nitrates, chlorides, fluorides, and heavy metals are included. A laboratory test for measuring scaling potential using a rotating ring disc electrode has also been developed. (Little-Battelle)  
W73-08027

#### MIREX RESIDUES IN WILD POPULATIONS OF THE EDIBLE RED CRAWFISH (PROCAMBARUS CLARKI),

Animal and Plant Health Inspection Service, Gulfport, Miss. Plant Protection and Quarantine Programs.

G. P. Martin, J. H. Ford, and J. C. Hawthorne. Bulletin of Environmental Contamination and Toxicology, Vol 8, No 6, p 369-374, December, 1972. 1 tab, 10 ref.

Descriptors: \*Crawfish, \*Pesticide residues, Crustaceans, Invertebrates, Insecticides, DDT, Gas chromatography, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Solvent extractions, Chemical analysis, Pesticide toxicity, Water pollution effects, TDE, DDE.

Identifiers: \*Mirex, \*Procambus clarki, Aroclor 1260, Sample preparation, Chlordane, Toxaphene, Detection limits, Arthropods, Macroinvertebrates, Decapods, Electron capture gas chromatography, Metabolites.

Red crawfish from southcentral Louisiana were analyzed in order to determine if mirex residues in specimens from treated areas are beginning to reach those levels found to affect crawfish under laboratory conditions. Crawfish samples were washed to remove adhering materials, ground and mixed in a blender, a 50-gram subsample extracted in organic solvents, and analyzed by electron capture gas chromatography. Samples were also analyzed for DDT and its metabolites (TDE, DDE). Chlordane, Toxaphene, and Aroclor 1260. The level of detection was 0.01 ppm. DDT residues ranged from 0.02-0.44 ppm while mirex residues were barely detectable. PCB residues were detected in few instances and 0.11 ppm chlordane was detected in one sample. No results are given for TDE, DDE, toxaphene or Aroclor 1260. There is no real evidence that the insecticide mirex has any significant effect on crawfish populations. (Holoman-Battelle)  
W73-08030

#### PCB RESIDUES IN ATLANTIC ZOOPLANKTON,

California Univ., Berkeley. Inst. of Marine Resources.

R. W. Riesbrough, V. Vreeland, G. R. Harvey, H.

P. Miklas, and G. M. Carmignani.

## Identification of Pollutants—Group 5A

Bulletin of Environmental Contamination and Toxicology, Vol 8, No 6, p 345-355, December 1972. 1 fig, 1 tab, 23 ref.

Descriptors: \*Polychlorinated biphenyls, \*Pesticide residues, \*Zooplankton, \*Atlantic Ocean, \*Pollutant identification, Chemical analysis, \*DDT, Chlorinated hydrocarbon pesticides, Absorption, Marine animals, Insecticides, Gas chromatography, Sampling, Solvent extractions, \*DDE.

Identifiers: P P DDT, p p DDE, Isomers, Sample preparation.

The results of measurements of PCB and other chlorinated hydrocarbons are presented for zooplankton samples from the Atlantic Ocean. The samples were obtained during 3 cruises of the R/V Atlantis II of the Woods Hole Oceanographic Institution with a No. 6 mesh plankton net. Immediately after collection, the plankton was transferred to polycarbonate or glass jars and frozen. Samples were prepared for gas chromatographic analysis by extraction in hexane. Dry and lipid weight determinations were also made. PCB in the zooplankton from the stations on the continental shelf and slope ranged from 2.4 to 260 ppm, with a median value of approximately 40 ppm. Median percent lipid weight of dry weight was 3.8 percent. On a dry and wet weight basis, representative concentrations in zooplankton from the shelf and slope areas would be in the order of 1.5 ppm and 0.15 ppm, respectively. Collections from the North Atlantic contained high concentrations of PCB, ranging from 0.007 to 0.45 ppm on a wet weight basis. Residues of p,p'-DDT and p,p'-DDE were found to be in the range of less than 0.00001-0.08 ppm and 0.00007-7.0 ppm, respectively. (Holoman-Battelle) W73-08031

SEPARATION AND QUANTITATIVE DETERMINATION OF THE YTTRIUM GROUP LANTHANIDES BY GAS-LIQUID CHROMATOGRAPHY,

Iowa State Univ., Ames. Inst. for Atomic Research; and Iowa State Univ., Ames. Dept. of Chemistry.

C. A. Burgett, and J. S. Fritz.

Analytical Chemistry, Vol 44, No 11, p 1738-1742, September 1972. 5 fig, 3 tab, 10 ref.

Descriptors: \*Separation techniques, \*Aqueous solutions, Chemical reactions, Chemical analysis, Gravimetric analysis, Solvent extractions, Heavy metals, Methodology, Gas chromatography, Chelation, Nuclear magnetic resonance, Organic compounds, Iron, Aluminum, Sulfur compounds. Identifiers: \*Electron capture gas chromatography, \*Flame ionization gas chromatography, \*Lanthanides, \*Yttrium metal, Chemical recovery, Rare earth elements, Detection limits, Chemical interference, Thermogravimetry, Precision, Mixtures, Ligands, Polyfluorinated beta-diketones, Organic solvents, Gas liquid chromatography, Sample preparation, F-19, Fluorine radioisotopes, Gadolinium, Terbium, Dysprosium, Holmium, Erbium, Thulium, Ytterbium, Lutetium, Yttrium, Uranium, Thorium, Scandium, Di-n-butylsulfoxide.

A gas chromatographic method is reported for the separation and subsequent quantitative determination of the yttrium group lanthanides. The lanthanides are synergistically extracted from aqueous solution with the polyfluorinated beta-diketone 1,1,1,2,2,6,6,7,7,7-decafluoro-3,5-heptanedione, (H(FHD)), as ligand, and di-n-butylsulfoxide (DBSO) as neutral donor. The composition of the extracted species is reported to be R.E. (FHD)3.2DBSO. Thermogravimetric analysis of the complexes is reported. Analytical curves were prepared and found usable through a range of 0.1 to 1.0 microgram metal. Individual lanthanides were determined with 97.5 percent recovery with a relative standard deviation of plus or minus 1.9 ppb. Mixtures of lanthanides were determined

with 97.1 recovery with a relative mean deviation of plus or minus 2.3 ppb and a relative standard percent deviation of plus or minus 3.1 ppb. Detection limits were determined for all of the rare earths. The detection limit was taken to be that amount of mixed ligand-complex necessary to give a chromatographic peak response equal to or greater than twice the background response. The detection limit observed was 20 micrograms metal for all the rare earth. The response to the flame ionization detector varied from metal to metal. When the electron capture detector was employed, it was extremely sensitive to the complexes; however, concentrations of 20 micrograms metal were sufficiently high to overload the detector even at purge flow rates of 400 ml/min. When the concentration was lowered, no response was observed. (Long-Battelle) W73-08033

SUPPORT-BONDED POLYAROMATIC COPOLYMER STATIONARY PHASES FOR USE IN GAS CHROMATOGRAPHY, Applied Automation, Inc., Bartlesville, Okla. Systems Research Dept. For primary bibliographic entry see Field 07B. W73-08034

ELECTROCHEMICAL CELL AS A GAS CHROMATOGRAPH-MASS SPECTROMETER INTERFACE,

Northgate Lab., Hamden, Conn. For primary bibliographic entry see Field 02K. W73-08035

PLASMA CHROMATOGRAPHY OF THE MONO-HALOGENATED BENZENES, Waterloo Univ. (Ontario). Dept. of Chemistry.

F. W. Karasek, and O. S. Tatone. Analytical Chemistry, Vol 44, No 11, p 1758-1763, September, 1972. 7 fig, 2 tab, 14 ref.

Descriptors: \*Chemical analysis, Instrumentation, Aromatic compounds.

Identifiers: \*Plasma chromatography, \*Monohalogenated benzenes, Chromatography peaks, Chlorobenzene, Bromobenzene, Iodobenzene, Fluorobenzene, Thermal electrons, Sample preparation.

Using thermal electrons and positive reactant ions from nitrogen gas, both positive and negative plasmagram patterns have been obtained for fluorobenzene, chlorobenzene, bromobenzene, and iodobenzene. The plasmagrams give characteristic qualitative data. Positive plasmagrams show protonated molecular ions containing one and two molecules; the negative plasmagrams, except for the fluorobenzene, show only a strong halogen ion peak, which provides experimental evidence for dissociative electron capture by thermal electrons. (Long-Battelle) W73-08037

PIEZOELECTRIC DETECTORS FOR ORGANOPHOSPHORUS COMPOUNDS AND PESTICIDES,

Louisiana State Univ., New Orleans. Dept. of Chemistry.

E. P. Scheide, and G. G. Guilbault.

Analytical Chemistry, Vol 44, No 11, p 1764-1768, September, 1972. 6 fig, 2 tab, 23 ref.

Descriptors: \*Pollutant identification, \*Organophosphorus pesticides, \*Chemical analysis, Organic compounds, Instrumentation, Selectivity, Methodology.

Identifiers: \*Piezoelectric detector, Paroxon, O O-diethyl-o-p-nitrophenyl phosphate, Chemical interference, Sensitivity, Sample preparation, Detection limits.

A quartz piezoelectric crystal coated with a substrate has been used for the detection of small mass changes caused by the selective adsorption of organophosphorus compounds and pesticides. Incorporation of the crystal into a variable oscillator circuit and measurement of the change in frequency of the crystal due to the increase in mass allows a highly sensitive indication of the amount of organophosphorus compound present in the atmosphere down to the part per million level. Instrumentation is relatively inexpensive and can be easily used in the field. Analysis is non-destructive and requires very little time. At cut quartz crystals with fundamental frequencies of 9.0 MHz were coated with various inorganic substrates and these were evaluated as to selectivity and sensitivity with respect to organophosphorus pollutants. Other parameters that affect the efficiency of the detector were also studied and evaluated. The detector has potential use as both an air pollution sensor and a specific gas chromatography detector. (Long-Battelle) W73-08038

COLORIMETRIC DETERMINATION OF CALCIUM USING REAGENTS OF THE GLYOXAL BIS (2-HYDROXYANIL) CLASS,

Clemson Univ., S.C. Dept. of Chemistry and Geology.

C. W. Milligan, and F. Lindstrom. Analytical Chemistry, Vol 44, No 11, p 1822-1829, September, 1972. 10 fig, 5 tab, 16 ref.

Descriptors: \*Clorimetry, \*Chemical analysis, \*Calcium, \*Chelation, Chemical reactions, Alkali metals, Cations, Anions, Color reaction, Hydrogen ion concentration, Sodium, Potassium, Magnesium, Strontium, Aluminum, Iron, Cobalt, Nickel, Zinc, Cadmium, Copper, Lead, Nitrates, Phosphates, Chlorides, Silicates, Sulfates.

Identifiers: \*Glyoxal bis (2-hydroxyanil), \*Reagents, Chemical interference, Metal chelates, Reproducibility, Mixtures, Absorption spectra, Lithium, Barium, Uranyl, Tin, Chlorates.

The determination of calcium in solution from 0.1 to 15 micrograms per milliliter is easy, accurate, and reproducible with reagents of the glyoxal bis (2-hydroxyanil) class. A few precautions are needed: obviously all chemicals must be calcium-free and the sequence of adding the reagents is critical. However, no extraction is needed and a simple, inexpensive colorimeter is all the instrumentation necessary. The reagents chelate calcium yielding red color at a high pH so interferences are limited. The various reagents have been evaluated and the chelate combining ratios and the apparent formation constants measured. (Long-Battelle) W73-08040

DETERMINATION OF NANOGRAM QUANTITIES OF SIMPLE AND COMPLEX CYANIDES IN WATER,

Department of the Environment, Ottawa (Ontario). Water Quality Div.

P. D. Goulen, B. K. Afghan, and P. Brooksbank. Analytical Chemistry, Vol 44, No 11, p 1845-1849, September 1972. 7 fig, 3 tab, 6 ref.

Descriptors: \*Methodology, \*Distillation, \*Colorimetry, \*Water analysis, Automation, Industrial wastes, Pollutant identification, Iron, Copper, Chemical analysis, Separation techniques, Laboratory equipment, Chlorides, Sulfates, Zinc, Carbonates, Nitrates.

Identifiers: \*Cyanides, Detection limits, Sample preparation, Ottawa River, Synthetic water, Chemical interference, Standard methods, Bisulfites, Chemical recovery, Sulfides, Thiocyanates.

Two methods for analysis of cyanide in water are described. In the first, modifications to the normal distillation procedure given in 'Standard Methods'

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### Group 5A—Identification of Pollutants

are made to lower the limits of detection of this method to 5 micrograms/liter CN. An automated method is described that enables 10 samples per hour to be analyzed with a limit of detection of 1 microgram/liter CN. With a sample size of 7 ml, this corresponds to a detection limit of 7 nanograms CN. Distinction is made between simple and complex cyanides by irradiation with ultraviolet light. This irradiation breaks down complex cyanides, including those of cobalt and iron. (Long-Battelle) W73-08041

**IMPROVED UREA ELECTRODE,**  
Louisiana State Univ., New Orleans. Dept. of Chemistry.  
G. G. Guilbault, and G. Nagy.  
Analytical Chemistry, Vol 45, No 2, p 417-419, February 1973. 4 fig, 7 ref.

Descriptors: \*Aqueous solutions, \*Pollutant identification, \*Ureas, Selectivity, Potassium, Ions, Enzymes, Electrical stability, Zeta potential, Construction, Methodology, Electrochemistry.

Identifiers: \*Urea electrode, \*Ion selective electrodes, Biological fluids, Response time, Urease, Ammonium electrode.

An improved urea electrode was made by covering the active surface of a solid type ammonium electrode with a physically immobilized urease (enzyme) reaction layer. This layer was made according to the procedure of Guilbault and Montalvo (1970). A nylon net was placed over the sensor surface and fixed with rubber rings. A solution of 175 mg urease in 0.9 ml monomer solution was dropped onto the netting and polymerized by light for 60 min. The ammonium selective electrode was made using the antibiotic Nonactin as the active ingredient embedded in a silicone rubber matrix. Studies of the electrode show it to have good stability and response characteristics. It allows a convenient determination of urea in water solution, an estimation of urea content of biological fluids of unknown potassium ion concentration, and an accurate measurement of the urea concentration in biological fluids of approximately known potassium concentration. Some theoretical aspects of the enzyme electrode are discussed. (Holoman-Battelle) W73-08042

**ACTIVITY MEASUREMENTS AT HIGH IONIC STRENGTHS USING HALIDE-SELECTIVE MEMBRANE ELECTRODES,**  
State Univ. of New York, Buffalo. Dept. of Chemistry.  
J. Bagg, and G. A. Rechnitz.  
Analytical Chemistry, Vol 45, No 2, p 271-276, February 1973. 5 tab, 22 ref.

Descriptors: \*Halides, \*Measurements, Bromides, Chlorides, Fluorides, Electrochemistry, Iodides, Sodium chloride, Electrolytes, Anions.

Identifiers: \*Ion selective electrodes, \*Membrane electrodes, \*Halide selective electrodes, \*Ionic strength, \*Ionic activity, Potassium chloride, Potassium bromide, Potassium fluoride, Lithium chloride.

The newer halide-selective electrodes have been examined in a cell with a homionic liquid-junction which does not require a reversible cation-selective electrode or the use of extra-thermodynamic assumptions in the calculation of theoretical emf. These electrodes have been shown to have nearly theoretical potentiometric response in chloride, bromide, and fluoride solutions up to 4-5 molal. The iodide-selective electrode is restricted by deterioration of the electrode surface to solutions less than 0.5 molal. The single-ion activity convention, based upon hydration considerations, proposed by Bates, Staples, and Robinson, combined with the Henderson equation for residual liquid-junction potentials, fitted the data for a cell

with heterionic junction up to 6 m NaCl, 4 m KC1, 4 m KBr, 3 m KF, and 1 m LiCl. The results are consistent with previously proposed mechanistic models for the operation of crystal membrane electrodes. (Holoman-Battelle) W73-08043

**ELECTROCHEMICAL CHARACTERISTICS OF THE GOLD MICROMESH ELECTRODE,**  
Wisconsin Univ., Madison. Dept. of Chemistry.  
For primary bibliographic entry see Field 02K. W73-08044

**ORGANOCHLORINE PESTICIDE RESIDUES IN WATER, SEDIMENT, ALGAE, AND FISH, HAWAII - 1970-71,**  
Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.

A. Bevenue, J. W. Hylin, Y. Kawano, and T. W. Kelley.  
Pesticides Monitoring Journal, Vol 6, No 1, p 56-64, June 1972. 3 fig, 8 tab, 27 ref.

Descriptors: \*Chlorinated hydrocarbon pesticides, \*Pesticides residues, \*Sediments, \*Algae, \*Fish, Chemical analysis, \*Sewage effluents, Water analysis, Potable water, Rain water, \*Hawaii, DDT, Dieldrin, DDE, DDD, Gas chromatography, Methodology, Heptachlor, Aldrin, Solvent extractions, Separation techniques, Plankton, Aroclors.

Identifiers: Lindane, Heptachlor epoxide, Chlordane, Sample preparation, Detection limits, Electron capture gas chromatography, Guppy, Molly, p,p'-DDD, p,p'-DDE, p,p'-DDT, Ala Wai Canal, Kapalama Canal, Kalihi Stream, Sand Island Outfall.

Rainwater, drinking water, and nonpotable waters in Hawaii were sampled and found to contain chlorinated insecticide residues in the low parts-per-trillion range. A portion of each sample was tested for chloride ion concentration and pH and the remainder subjected to hexane extraction, evaporation and gas chromatography. Sewage water samples were prepared for (1) pentachlorophenol identification by pH adjustment, hexane extraction, diazomethane treatment, hexane dissolution, and gas chromatography, and for (2) chlorinated pesticides other than PCP by the combined Florisil and silicic acid procedure of Armour and Burke. Dredged sediment samples were subjected to sodium sulfate, hexane extraction and the Mills' Florisil cleanup procedure, and then gas chromatographed. The cleanup procedure used for algae and fish samples prior to gas chromatography was a modification of the method of Kadoum. Dieldrin, p,p'-DDT, and lindane were the pesticides most prevalent; pentachlorophenol was present in samples from a sewage fallout. The ratio of chlorinated pesticide residues in canal waters to residues in algae, sediment, and fish from the same canals was 1:4,000:9,000:32,000, respectively. According to proposed water quality standards, results of this study indicated that pollution of Hawaii's water by organochlorine pesticides does not occur to any significant degree. (Mackan-Battelle) W73-08045

Descriptors: \*Halides, \*Measurements, Bromides, Chlorides, Fluorides, Electrochemistry, Iodides, Sodium chloride, Electrolytes, Anions.

Identifiers: \*Ion selective electrodes, \*Membrane electrodes, \*Halide selective electrodes, \*Ionic strength, \*Ionic activity, Potassium chloride, Potassium bromide, Potassium fluoride, Lithium chloride.

**ORGANOCHLORINE PESTICIDE RESIDUES IN COMMERCIALLY CAUGHT FISH IN CANADA - 1970,**

Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.  
J. Reinke, J. F. Utte, and D. Jamieson.  
Pesticides Monitoring Journal, Vol 6, No 1, p 43-49, June 1972. 1 fig, 1 tab, 7 ref.

Descriptors: \*Chlorinated hydrocarbon pesticides, \*Polychlorinated biphenyls, \*Commercial fish, \*Canada, \*Pesticide residues, DDT, DDE, DDD, Dieldrin, Heptachlor, Aldrin, Separation techniques, Water analysis, Freshwater fish, Saline water fish, Chemical analysis, Gas chromatography, Salmon, Yellow perch, Mullets, Rainbow trout, Catfishes, Carp, Lake trout, Bullheads, Walleye, Lake Erie, Lake Ontario, Lake Michigan, Lake Superior, St. Lawrence River, Lake Huron, Solvent extractions, Pikes, Smerlets, Sauger.

Identifiers: \*Gas liquid chromatography, \*Thin layer chromatography, Heptachlor epoxide, Lindane, Chlordane, Metabolites, Isomers, Precision, Chemical recovery, Detection limits, Sample preparation, Burbot, Muktuk, Coho salmon, Whitefish, Kokanee, Yellow pickerel, Sturgeon, Sheepshead, Alewife, Crappies, Tullibee, Lake Winnipeg, Sturgeon River, Ottawa River, Lake St. Clair, p,p'-DDT, p,p'-DDD, p,p'-DDE, p,p'-DDT, Lake Nipigon, Lake St. Paul, Cold River, Bow River.

A modified Mills extraction method was coupled with a thin-layer chromatographic confirmation and a gas chromatographic quantification of organochlorine pesticide residues in commercially caught fish from 78 locations in 68 central Canadian lakes and rivers. Only a few of these water yielded fish with appreciable concentrations of DDT and its analogs (greater than 1 ppm), and in only a few cases did the concentrations exceed the maximum permissible level of 5 ppm. Of the other organochlorine pesticides commonly used, namely lindane, aldrin, heptachlor, heptachlor epoxide, endrin, dieldrin, and chlordane, only dieldrin was found at significant levels in a number of samples, but these amounts were still below the maximum permissible level. Trace amounts of lindane were found in some samples. The presence of polychlorinated biphenyls (PCB's) was noted in samples from the Great Lakes and the south end of Lake Winnipeg. PCB's were separated from DDE on aluminum oxide G (type E) plates run in a triethylamine-hexane solvent system. (Mackan-Battelle) W73-08048

**CHEMICAL RESIDUES IN LAKE ERIE FISH - 1970-71,**  
Food and Drug Administration, Cincinnati, Ohio.  
R. L. Carr, C. E. Finsterwalder, and M. J. Schibi.  
Pesticides Monitoring Journal, Vol 6, No 1, p 23-26, June 1972. 1 fig, 2 tab, 6 ref.

Descriptors: \*Lake Erie, \*Pesticide residues, \*Mercury, \*Freshwater fish, DDE, DDT, Dieldrin, Polychlorinated biphenyls, Yellow perch, Channel catfish, Carp, Drums, White bass, Pollutant identification, Chlorinated hydrocarbon pesticides, Great Lakes, Ohio.

Identifiers: TDE, Gas liquid chromatography, Thin layer chromatography, Coho salmon, Biological magnification, Accumulation, Perca flavescens, Oncorhynchus kisutch, Roccus chrysops, Aplodinotus grunniens, Ictalurus punctatus, Cyprinus carpio.

Yellow perch, coho salmon, carp, channel catfish, freshwater drum, and white bass from the Ohio shore of Lake Erie were analyzed during 1970-71 for residues of chlorinated pesticides (DDE, TDE, DDT, and dieldrin), polychlorinated biphenyls (PCB's), and mercury. The method employed for extraction and cleanup of samples to determine DDT residues, dieldrin, and PCB's was that described by Porter, Young, and Burke. Thin-layer chromatography and gas-liquid chromatography were used for confirmation and quantitative analysis of the residues. All but 1 of the 80 samples analyzed contained DDT and/or its metabolites; PCB's were found in all samples. Fifty-three of the 80 samples were analyzed for mercury, and all were found positive. Average levels of residues for the species sampled ranged from 0.06 to 0.42 ppm for DDE; 0.07 to 0.52 ppm, TDE; 0.03 to 0.25 ppm, DDT; 0.18 to 0.90 ppm, total DDT; 0.01 to 0.07 ppm, dieldrin; 0.08 to 4.4 ppm, PCB's; and 0.12 to 0.64 ppm, mercury. The highest average residue levels of total DDT were in coho salmon and channel catfish. Average levels of PCB's were

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significantly higher in channel catfish, and levels of mercury were significantly higher in white bass. (Mackan-Battelle)  
W73-08049

**OSCILLOMETRIC TITRATION OF INORGANIC HALIDES WITH MERCURY (II) ACETATE,**  
Orszagos Gyogyszereseti Intezet, Budapest (Hungary).  
A. Fischer, and E. Poagay.  
Zeitschrift fur Analytische Chemie, Vol 258, No 5, p 356-358, May 16, 1972. 1 fig, 1 tab, 3 ref.

Descriptors: \*Halides, \*Pollutant identification, Ions, Movement, Aqueous solutions, Chlorides, Bromides, Iodides, Chemical analysis, Inorganic compounds, Instrumentation, Volumetric analysis.

Identifiers: \*Mercury (II) acetate, \*Oscillometric titration, Relative ion mobility, Oscillotitration, Precision.

An oscillometric titration method is presented for the determination of inorganic halides with mercury (II) acetate. A standardized mercury (II) acetate solution sample is added in 0.5-ml portions to the capacitive cell of an oscillotitration system and the instrumental deflection is then plotted against the volume of standard solution added. The method is based on the difference between the relative ion mobility of the acetate and halide ions, and the well known slight dissociation of the mercury halides and can therefore be used for the titrimetric determination of the inorganic chlorides, bromides, and iodides. Errors in the determination of various halogenides were between 0.2 and 1.4 percent. (Byrd-Battelle)  
W73-08050

**DETECTION, DECONTAMINATION AND REMOVAL OF CHEMICALS IN WATER,**  
Edgewood Arsenal, Md. Army Development and Engineering Directorate.

D. H. Rosenblatt, and J. Epstein.  
Proc available from the National Technical Information Service as AD-738 544, \$3.00 in paper copy, \$1.45 in microfiche. In: Proceedings of First Meeting on Environmental Pollution, 15-16 April 1970. Sponsored by American Ordnance Association, Edgewood Arsenal Special Publication EASP 100-78. February 1972, p 75-82.

Descriptors: \*Pollutant identification, \*Chemicals, Wastes, \*Chemical warfare, \*Water pollution, \*Water pollution sources, Water pollution treatment, Water pollution control, Public health, Organoleptic properties, Chemical analysis.

Identifiers: \*Nerve gases, \*Vesicants, \*Arsenicals.

Chemical agent water contamination problems as related to those of more conventional types of pollution are examined. Certain military chemical contaminants such as the nerve gases, the vesicants and the arsenicals pose hazards when present in water. Therefore, the means of identification, detection, and treatment must be found. Enzymatic analyses worked well for the identification and detection of militarily significant chemical pollutants. They were extremely rapid and sensitive and even more or less specific through the use of a selective enzyme or parallel use of several enzymes. Decontamination was achieved in most cases by utilizing the super-chlorination-carbon treatment. (Smith-Texas)  
W73-08114

**LIQUID CHROMATOGRAPHY OF CARBAMATE PESTICIDES,**  
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.  
A. D. Thruston, Jr.

Copy available from GPO Sup Doc as EP1.23/2-72-079, \$0.55; microfiche from NTIS as PB-219 669, \$1.45. Environmental Protection Technology Series Report No EPA-R2-72-079, October 1972, 15 p, 3 fig, 3 tab, 6 ref. EPA Project No 16020 EWC.

Descriptors: \*Carbamate pesticides, \*Pollutant identification, Organic pesticides, Chromatography, Analytical techniques.

Identifiers: \*Liquid chromatography, \*Retention time, Baygon, Furadan, Matacil, Mobaam, Sevin, UC 10354, UC 8454, Carbamate, RE 5305, Mesurol, Zectect, Ultraviolet detectors, Carbaryl, Aprocarb, Carbophen, Aminocarb, Terbutol, Dazomet, Methionyl, Sirmate (2-3-isomer), Sirmate (3-4-isomer), Bux, Azak, Benomyl, IPC, CIPC, Dimetilan, Temik, Swep, Barban, Thiram, Mylone, Lannate.

Standard solutions of 23 carbamate pesticides prepared in isopropanol were analyzed using a DuPont Model 820 liquid chromatograph equipped with an ultraviolet photometric detector. Stainless steel columns (1 m x 2 mm i.d.) packed with either Permaphase ODS (octadecyl silane) or Permaphase ETH (ether) were used with the following mobile phases: 6 and 30 percent MeOH in water, hexane, one percent isopropanol/hexane, and 4 percent isopropanol/hexane. The retention times of the pesticides are given. The UV detector required 20-150 ng for the pesticides studied to give a 25 percent full-scale recorder response. (Holoman-Battelle)  
W73-08129

**QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART I. NORTH ATLANTIC SLOPE BASINS.**

Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08155

**DISSOLVED HELIUM IN GROUNDWATER: A POSSIBLE METHOD FOR URANIUM AND THORIUM PROSPECTING,**  
McMaster Univ., Hamilton (Ontario). Dept. of Physics.  
For primary bibliographic entry see Field 02K.  
W73-08157

**TECHNIQUE FOR MEASURING METALLIC SALT EFFECTS UPON THE INDIGENOUS HETEROTROPHIC MICROFLORA OF A NATURAL WATER,**  
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.  
L. J. Albright, J. W. Wentworth, and E. M. Wilson. Water Research, Vol 6, No 12, p 1589-1596, December 1972. 2 fig, 3 tab, 12 ref.

Descriptors: \*Metals, \*Salts, Water pollution effects, \*Aquatic microorganisms, \*Methodology, Sodium chloride, Radioactivity techniques, Bioassay, Heavy metals, Cations, Chlorides, Cadmium, Sodium, Alkali metals, Chromium, Mercury, Copper, Nickel, Lead, Zinc, Spectrometers, Aquatic bacteria.

Identifiers: \*Heterotrophic bacteria, \*Viability, Substrate utilization, Silver sulfate, Barium chloride, Cadmium chloride, Chromium chloride, Mercury chloride, Copper chloride, Nickel chloride, Lead chloride, Zinc chloride, Glucose, Silver, Sodium metabisulfite, Barium, Mercuric chloride, Cupric chloride, Scintillation counting.

A heterotrophic activity assay method is described which may be used to determine the effects of several metallic salts,  $Ag_2SO_4$ ,  $NaAsO_3$ ,  $BaCl_2 \cdot 2H_2O$ ,  $CdCl_2 \cdot 2.5H_2O$ ,  $CrCl_2 \cdot 6H_2O$ ,  $CuCl_2$ ,  $HgCl_2$ ,  $NaCl$ ,  $NiCl_2 \cdot 6H_2O$ ,  $PbCl_2$  and  $ZnCl_2$ , at very low concentrations, upon the net activity of the native heterotrophic microflora of an aquatic ecosystem, without unduly disturbing

in situ conditions. The method is based upon the uptake and mineralization of a radioactivity labeled metabolite (C-14-glucose) by native heterotrophic microflora and the analysis of data by Michaelis-Menten enzyme kinetics equations. A 100-ml water sample was collected, temperature determined, and divided into 25-ml portions, each of which was treated with 0.0538, 0.2690, 0.5375 or 0.8075 microgram amounts of C-14-glucose. Five milliliters were removed from each portion and placed in separate 25-ml erlenmeyer flasks which were sealed immediately. The reaction and control were incubated with reciprocal shaking (60 strokes/min) in the dark at the same temperature of the water when sampled. After 0.5 h incubation the reaction flasks were acidified to about pH 1.0 to stop microbial activity and to drive off C-14  $CO_2$  which was trapped on phenylamine-impregnated Whatman paper. After further incubation for an hour, the Whatman papers were removed, placed in scintillation vials containing a toluene-based cocktail of 2,5-diphenyloxazole (0.4 percent) and 1,4-bis-(5-phenyloxazolyl)-1-2-benzene (0.01 percent). The aqueous contents of each flask were filtered, washed, dried at 60°C for 15 min and added to vials containing the same cocktail. Counting was done with a Beckman LS-250 scintillation spectrometer. Salt effects upon bacterial viability were determined using nutrient agar plate counts immediately before and 0.5 h after treatment of water samples. Petri plates were incubated at 15 degrees C for 96 h before counting. Concentrations of metallic salts which resulted in bacterial death also caused erratic uptake and mineralization rates of C-14-glucose whereas sublethal concentrations, as determined by nutrient agar plate counts, caused a non-competitive inhibition of maximum heterotrophic activity and markedly increased the turnover time of the glucose substrate. (Holoman-Battelle)  
W73-08236

**UTILIZING METAL CONCENTRATION RELATIONSHIPS IN THE EASTERN OYSTER (CRASSOSTREA VIRGINICA) TO DETECT HEAVY METAL POLLUTION,**  
Virginia Inst. of Marine Science, Gloucester Point. R. J. Huggett, M. E. Bender, and H. D. Slone. Water Research, Vol 7, No 3, p 451-460, March 1973. 9 fig, 4 ref.

Descriptors: \*Oysters, \*Pollutant identification, \*Heavy metals, \*Water pollution sources, Mollusks, Invertebrates, Salinity, Sampling, Cadmium, Copper, Zinc, Least squares methods, Virginia, Industrial wastes, Chesapeake Bay, Sediments, Estuaries, Saline water-freshwater interfaces, Statistical methods.

Identifiers: \*Crassostrea virginica, Macroinvertebrates, Atomic absorption spectrophotometry, James River, Hampton Roads, Elizabeth River, Data interpretation.

A total of 495 oysters were collected during February-May, 1971, at various sites in the Chesapeake Bay area, removed from the shell without puncturing, digested in concentrated  $HNO_3$ , and analyzed for Cd, Cu, and Zn using atomic absorption spectrophotometry. Examination of the data showed that oysters from the same sampling location often differed in metal concentration as much as 100 percent and occasionally 300 percent. These variable concentrations are assumed to be normally distributed around some population mean, therefore the sample mean from each location should approximate the population mean. Means were used only to ascertain the areal distribution of metals in the various river systems. The means showed that a concentration gradient existed in all systems and that each metal increased in concentration as fresh water was approached. Several assumptions were made. (1) The metals (Cu, Cd, and Zn) available to oysters in non-industrialized areas are from the natural weathering of rocks. (2) The ratio of copper to zinc in the weathering rocks is relatively constant within a drainage basin. (3)

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Oysters accumulate a constant percentage of each element available to them. Statistical analysis of the metal concentration data showed that a linear relationship exists between Cu and Zn, and Cd levels in contaminated and uncontaminated oysters. No single concentration for an action level can be set for cadmium, copper or zinc in oysters which will definitely indicate pollution sources. However, the approach described has been proven valid in the Chesapeake Bay and may be of use elsewhere. (Holoman-Battelle) W73-08237

**NUTRIENT STUDIES IN TEXAS IMPOUNDMENTS,** Union Carbide Corp., Tonawanda, N.Y. Linde Div. For primary bibliographic entry see Field 05C. W73-08241

**DEEP-SEA BENTHIC COMMUNITY RESPIRATION: AN IN SITU STUDY AT 1850 METERS,** Woods Hole Oceanographic Institution, Mass. K. L. Smith, Jr., and J. M. Teal. Science, Vol 179, No 4070, p 282-283, January 19, 1973. 1 tab, 13 ref.

Descriptors: \*Biochemical oxygen demand, \*Respiration, \*Metabolism, \*Benthos, Research equipment, Biological communities, Continental slope, Chemical oxygen demand, Oceans, Sea water.

Identifiers: \*Respirometers, Total oxygen demand, Ion selective electrodes, Recorders.

In situ measurements of oxygen uptake, as a measure of metabolic activity, were made on undisturbed deep-sea benthic communities by placing respirometers (bell jars) at a depth of 1850 meters on the continental slope south of New England. The respirometers consisted of two capped Plexiglas cylinders which enclosed 48 sq cm of sediment. A polarographic oxygen electrode in each chamber fed a signal to a Rustrak recorder housed in a glass sphere atop the unit. Each chamber was stirred by a magnetically driven stirrer. Uptake measurements were made over periods of 48-72 hours. Formalin injection was used to poison the biological oxygen demand. Additional measurements of total oxygen uptake and chemical oxygen demand were made from a research vessel using a drill rig equipped with a 2000-in drill pipe, a television camera pod, and a hook apparatus. Oxygen uptake under the bell jars ranged from 0.39-0.55 mg/sq m/hr. Values obtained from the research vehicle were 0.62 ml/sq m hr. These values were two orders of magnitude lower than values from shallow depths. After treatment of the sediments with formalin there was no measurable chemical oxygen uptake which shows that the total uptake is biological (community respiration). It is concluded that metabolic activity of deep-sea benthic communities is low. (Little-Battelle) W73-08245

**LOWER PH LIMIT FOR THE EXISTENCE OF BLUE-GREEN ALGAE: EVOLUTIONARY AND ECOLOGICAL IMPLICATIONS,** Wisconsin Univ., Madison. Dept. of Bacteriology. For primary bibliographic entry see Field 05C. W73-08248

**THE MICROBIOLOGY OF AN ACTIVATED SLUDGE WASTE-WATER TREATMENT PLANT CHEMICALLY TREATED FOR PHOSPHORUS REMOVAL,** Pennsylvania State Univ., University Park. Dept. of Microbiology. For primary bibliographic entry see Field 05D. W73-08250

**HIGH RESOLUTION FIELD IONIZATION MASS SPECTROMETRY OF BACTERIAL PYROLYSIS PRODUCTS,** Bonn Univ. (West Germany). Institut fuer Physikalische Chemie. H. R. Schulten, H. D. Beckey, H. L. C. Meuzelaar, and A. J. H. Boerboom. Analytical Chemistry, Vol 45, No 1, p 191-195, January 1973. 1 fig, 1 tab, 20 ref.

Descriptors: \*Pseudomonas, \*Organic compounds, \*Pollutant identification, Mass spectrometry.

Identifiers: \*Field ionization-mass spectrometry, Sample preparation, Pseudomonas putida, Mass spectra, Pyrolysis.

The purpose was to explore the potentials of high resolution field ionization-mass spectrometry (FI-MS) for the analysis of extremely complex multicomponent mixtures and to perform a general survey of the chemical nature of bacterial pyrolysis products. The spectra were obtained with a double-focusing mass spectrometer equipped with an FI-ion source and specially designed emitter-adjusting manipulator. The sample was 5 mg of Pseudomonas putida bacteria, freeze-dried and pyrolyzed in a vacuum at 500C. Over 200 lines were revealed on the developed photoplate. Density measurements were made on about 180 lines. Accurate mass measurements are listed for 119 of the strongest lines, and proposed names are included for some compounds. The results show that the range of compounds that can be analyzed by FI-MS is greater than that of GLC-MS. The usefulness of FI-MS is limited by its inability to separate and identify isomers without additional information. Consequently, the two methods may be used to supplement each other. Differentiation of bacterial strains may be possible in this way. (Little-Battelle) W73-08256

**AUTOMATED DATA HANDLING USING A DIGITAL LOGGER,** Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry. For primary bibliographic entry see Field 07C. W73-08257

**DEMOUNTABLE RING-DISK ELECTRODE,** Illinois Univ., Urbana. School of Chemical Sciences.

For primary bibliographic entry see Field 07B. W73-08260

**LINEAR AND NONLINEAR SYSTEM CHARACTERISTICS OF CONTROLLED-POTENTIAL ELECTROLYSIS CELLS,** California Univ., Livermore. Lawrence Livermore Lab.

For primary bibliographic entry see Field 02K. W73-08261

**A PORTABLE VIRUS CONCENTRATOR FOR TESTING WATER IN THE FIELD,** Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology.

C. Wallis, A. Homma, and J. L. Melnick. Water Research, Vol 6, No 10, p 1249-1256, October, 1972. 3 fig, 12 ref.

Descriptors: \*Viruses, \*On-site tests, \*Equipment, \*Pollutant identification, \*Methodology, On-site investigations, Adsorption, Potable water, Filtration, Monitoring.

Identifiers: \*Portable virus concentrator, Adsorbents, Virus assays, Poliovirus, Metal complexes, Particulate matter, Plaque forming units, Detection limits.

A system is described for concentrating viruses from large volumes of water. The system consists

of a water pump, an electric generator, a series of clarifiers, a virus adsorbent, a virus reconcentrator, a 5- and a 1-gal pressure vessel with a small tank of nitrogen as a source of positive pressure, and ancillary equipment, all mounted on 2-wheel carts for easy portability. Standardization of the system was achieved by use of minute amounts of poliovirus. The virus was added to dechlorinated city tap water so that it could not be detected unless the virus was first concentrated. In the system, raw tap water containing virus is serially passed through clarifying filters of porosities of 5-1 microns to remove particulate matter, and then through a 1-micron cotton textile filter to electrostatically remove submicron ferric and other heavy metallic complexes. These filters do not detectably remove virus. Salts are then added to the running tap water to enhance the adsorption of virus to a fiberglass or cellulose acetate filter. Raw water could be processed at the rate of 300 gallons per hour, with total virus removal from the water and with 80 percent elution of the virus from the adsorbent. (Holoman-Battelle) W73-08262

**IDENTITIES OF POLYCHLORINATED BIPHENYL ISOMERS IN AROCLORS,** Environmental Protection Agency, Athens, Ga. Southeast Water Lab.

R. G. Webb, and A. C. McCall. Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 746-752, July, 1972. 3 fig, 2 tab, 15 ref.

Descriptors: \*Polychlorinated biphenyls, \*Aroclors, \*Pollutant identification, DDE, Gas chromatography, Water pollution sources, Mass spectrometry, Spectrometers, Chemical reactions, Chemical analysis, Organic compounds.

Identifiers: \*Infrared spectroscopy, \*Flame ionization gas chromatography, \*Sample preparation, Gas liquid chromatography, Chlorinated hydrocarbons, Isomers, 2,3,5-trichloroaniline, 2,4,5-trichlorodobenzene, Gomberg reaction, Ullmann reaction, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254.

Twenty-seven polychlorinated biphenyls (PCB) in Aroclors 1221, 1242, and 1254 were separated and identified by matching both their gas-liquid chromatographic (GLC) retention times and infrared spectra with known compounds prepared by the Gomberg or Ullmann reactions. Each Aroclor was mixed with p,p'-DDE prior to chromatographic analysis in order to relate observed PCB retention times to those for p,p'-DDE. The compounds identified by these methods are tabulated as well as those compounds prepared in this study that failed either the GLC or IR tests and were concluded to be absent from the Aroclors. (Long-Battelle) W73-08263

**LIQUID CHROMATOGRAPHY OF POLYCYCLIC AROMATIC HYDROCARBONS,** Food and Drug Administration, Washington, D.C. Div. of Chemistry and Physics.

N. F. Ives, and L. Giuffrida. Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 757-761, July, 1972. 2 fig, 1 tab, 22 ref.

Descriptors: \*Liquid chromatography, \*Polycyclic compounds, \*Aromatic hydrocarbons, \*Ultraviolet spectroscopy, \*Detection systems, Food additives, Preservatives, Durapak OPN, Cellulose acetate, Scanning spectrometer, Sample preparation.

Two column materials (Durapak-OPN and 40 percent cellulose acetate), used for liquid chromatographic analysis, were compared using a continuous monitoring UV detection system for the orders of elution and resolution of 18 polycyclic aromatic hydrocarbons. The detection system con-

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sisted of a nitrogen pressurized sample injection to control the rate of sample flow onto the column and subsequently control the rate of UV spectrometric analysis of compounds eluted from the column. The order of elution of the polycyclic hydrocarbons from both column materials is tabulated as individual retention times relative to pyrene. Neither system resolved all the compounds, but the use of both systems increased the number of compounds which were detected. The linearity of this detection system ranged from about 0.25 to greater than 12 micrograms using pyrene as a test compound, a tungsten or deuterium lamp, and a wavelength of 3358 Angstroms. (Long-Battelle)  
W73-08264

**DDT AND DDE RESIDUES IN BLOOD FROM CHILDREN, SOUTH CAROLINA - 1970,**  
Medical Univ. of South Carolina, Charleston.  
Dept. of Preventive Medicine.  
J. E. Keil, W. Weston, III, C. B. Loadholt, S. H. Sandifer, and J. J. Colclough.  
Pesticides Monitoring Journal, Vol 6, No 1, p 1-3, June, 1972. 1 fig, 3 tab, 7 ref.

Descriptors: \*DDT, \*DDE, \*Pesticide residues, \*South Carolina, Least squares method, Public health, Polychlorinated biphenyls, Gas chromatography, Methodology, Solvent extractions, Separation techniques, Pollutant identification, Poisons.  
Identifiers: \*Blood, \*Electron capture gas chromatography, Biological samples, Humans, Children, Blood plasma, Gas liquid chromatography, Sample preparation, p p' DDT, p p' DDE.

DDT and DDE residue levels in blood plasma from 192 children in South Carolina, ages 6-9 years, indicated that Negro children had levels two to three times higher than white children. Plasma samples were treated by multiple solvent extractions, evaporation, and dilutions in hexane and then injected into a gas chromatograph equipped with tritium foil electron capture detector. DDT residues averaged 18.4 ppb in Negroes and 6.7 ppb in whites; DDE values for these two races were 55.6 ppb and 24.8 ppb, respectively. White males in this group also had significantly higher levels of both compounds than white females. From the data in this study, baseline levels for a high-risk pediatric group, usually prone to pesticide poisoning, were established. (Mackan-Battelle)  
W73-08265

**ORGANOCHLORINE PESTICIDE LEVELS IN HUMAN SERUM AND ADIPOSE TISSUE, UTAH - FISCAL YEARS 1967-71,**  
Utah State Div. of Health, Salt Lake City.  
S. L. Warnick.  
Pesticides Monitoring Journal, Vol 6, No 1, p 9-13, June, 1972. 3 tab, 23 ref.

Descriptors: \*Utah, \*Pesticide residues, \*DDT, \*DDE, \*Dieldrin, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Gas chromatography, Pollutant identification, Separation techniques, Sampling, Methodology.  
Identifiers: \*Blood, \*Adipose tissue, Biological samples, Humans, Serum, p p' DDT, p p' DDE, Blood plasma.

A total of 1417 blood and 103 adipose tissue samples were collected over a 5-year period (1967-1971) from the general population and from persons occupationally exposed to pesticides in Utah. Extraction, cleanup and analyses performed included: the Radomski and the Mills, Onley and Gaiter methods for adipose tissue analysis; the Dale, Curley, and Cueto method for blood; and modifications of Mills' adipose and Dales' serum methods. The results supported previous evidence of no increase in pesticide storage in the general population since 1951 and a tendency towards decreased storage since 1966. (Mackan-Battelle)  
W73-08266

#### **MIREX AND DDT RESIDUES IN WILDLIFE AND MISCELLANEOUS SAMPLES IN MISSISSIPPI - 1970,**

Mississippi State Univ., State College. Dept. of Biochemistry.  
K. P. Baetcke, J. D. Cain, and W. E. Poe.  
Pesticides Monitoring Journal, Vol 6, No 1, p 14-22, June 1972. 4 tab, 11 ref.

Descriptors: \*Pesticide residues, \*Wildlife, \*DDT, \*Estuaries, Persistence, Food chains, Bird eggs, \*Mississippi, Pollutant identification, Path of pollutants, Solvent extractions, Organic pesticides, DDD, DDE, Catfishes, Sunfishes, Channel catfish, Game birds, Non-game birds, Song birds, Cattle, Milk, Annelids, Silage, Insects, Deer, Isopids, Oligochaetes, Insect control, Grasses, Freshwater fish.

Identifiers: \*Mirex, Electron capture gas chromatography, Thin layer chromatography, Infrared spectroscopy, Biological samples, Sample preparation, Detection limits, Chemical recovery, Metabolites, Adipose tissue, Brain, Liver, Arthropods, Crickets, Spiders, Blue heron, Cattle egret, Icterus punctatus, Lepomis cyanellus, Solenopsis saevissima, Fire ant, Bettles, Grasshoppers, Arachnids, Gas liquid chromatography, Festuca, Odontocleus virginianus, Gallus gallus, Colinus virginianus, Toxostoma rufum, Cyanocitta cristata, Sturnella magna, Meleagris gallopavo, Tyrannus tyrannus, Turdus migratorius, Strix varia, Bubulcus ibis, Florida caerulea, Lumbricus terrestris.

Samples of wildlife and a few miscellaneous samples, such as beef, were collected in Mississippi in 1970 and analyzed for the presence of mirex and DDT and its analogs. Analytical procedures chosen for extraction and cleanup for residue analysis involved methods described in the Pesticide Analytical Manual, Volumes I and III, and other previously described methods. Primary identification and quantification were accomplished by electron capture gas-liquid chromatography in the determinative step. Thin-layer chromatography and infrared spectroscopy were utilized for confirmation in selected samples. Levels of mirex residues were found to range from 0 ppm to a high of about 104 ppm; residues of DDT and its metabolites (DDTR equals DDT plus DDE plus DDD) were found to range from less than 0.001 ppm to 126 ppm. Comparisons of the amount of the two pesticides found in individual samples showed that mirex residues often exceeded DDT residues. The high levels of mirex residues found in some of these samples 1 year after treatment indicate that mirex can be considered a persistent pesticide. (Mackan-Battelle)  
W73-08267

#### **OIL SPILL SOURCE IDENTIFICATION,**

Esso Research and Engineering Co., Florham Park, N.J. Government Research Div.  
M. Lieberman.

Copy available from GPO Sup Doc as EPI.23/2-73-102, \$2.35; microfiche from NTIS as PB-219 822, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-102, February 1973. 175 p, 28 fig, 19 tab, 7 ref, 6 append. EPA Project 15080 HDL, 68-01-0058.

Descriptors: \*Oil spills, \*Pollutant identification, \*Chemical analysis, \*Correlation analysis, \*Weathering, Gas chromatography, Mass spectrometry, Tagging, Water pollution sources.

Identifiers: Passive tagging, n-Paraffins, Polynuclear aromatics, Naphthalenes, Nickel, Vanadium, Nitrogen, Sulfur.

Five different crude oils, two residual fuel oils (No. 4 and No. 5) and one distillate fuel oil (No. 2) were subjected to simulated weathering in the laboratory. Samples were weathered for 10 and 21 days at 55 and 80°F, under high and low salt water washing rates. 'Weathered' and 'unweathered' oil samples were analyzed by low voltage mass spectroscopy (polynuclear aromatics), high voltage

mass spectroscopy (naphthalenes), gas chromatograph (n-Paraffins), emission spectroscopy (nickel/vanadium), X-ray total sulfur and Kjeldahl total nitrogen techniques. Several compound indices were adequately stable toward simulated weathering to discriminate between like and unlike pairs of oils. Discriminant function analysis was used to select the best compound indices for the oils used. Using these indices, weathered and unweathered samples were correctly paired with high statistical confidence. (EPA)  
W73-08289

#### **THE APPEARANCE AND VISIBILITY OF THIN OIL FILMS ON WATER,**

Edison Water Quality Research Lab., N.J.  
B. Hornstein.

Copy available from GPO Sup Doc as EPI.23/2-72-039, \$2.50; microfiche from NTIS as PB-219 825, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-72-039, August 1972. 95 p, 31 fig, 5 tab, 8 ref.

Descriptors: \*Oil-water interfaces, \*Thin films, \*Oil wastes, \*Color, Theoretical analysis, Laboratory tests, On-site investigations, Water pollution, Oil pollution, Water pollution sources, \*Pollutant identification.

Identifiers: \*Visibility, Iridescent films, Optical interference, Reflectivity.

Oil films of controlled thickness up to 3000 nanometers, upon water surfaces in the laboratory, confirm an inherent and orderly thickness-appearance relationship which is independent of oil type and water type. These laboratory studies also investigated the effects of viewing conditions upon the ease of visibility of these thin films. Out-of-doors observations were made; these and the observations reported by other sources were found to correspond with the laboratory results. The visibility of a thin oil film depends not only upon its thickness-dependent inherent appearance, but also upon conditions external to the film. These include nature of illumination and sky conditions, sun angle, color and depth of water, color of bottom, and viewing angle. Color photographs are included for illustration of the points discussed. (EPA)  
W73-08295

#### **MICROFLORA OF THE NEUSTON AND ITS ROLE IN WATER BODIES,**

Polskie Towarzystwo Przyrodnicze im. Kopernika, Warsaw.

For primary bibliographic entry see Field 05C.  
W73-08335

#### **SULFIDE DETERMINATION IN SUBMERGED SOILS WITH AN ION-SELECTIVE ELECTRODE,**

Ministry of Agriculture, Cairo (Egypt).

For primary bibliographic entry see Field 02K.  
W73-08351

#### **APPLICATION OF REMOTE SENSING TO SOLUTION OF ECOLOGICAL PROBLEMS,**

IBM Federal Systems Div., Bethesda, Md.

For primary bibliographic entry see Field 07B.  
W73-08358

#### **INTERDISCIPLINARY APPLICATIONS AND INTERPRETATIONS OF REMOTELY SENSED DATA,**

Pennsylvania State Univ., University Park.

For primary bibliographic entry see Field 07B.  
W73-08363

#### **USING LIGHT TO COLLECT AND SEPARATE ZOOPLANKTON,**

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5A—Identification of Pollutants

For primary bibliographic entry see Field 07B.  
W73-08406

**CHEMICAL ANALYSES OF SELECTED PUBLIC DRINKING WATER SUPPLIES (INCLUDING TRACE METALS),**  
Wisconsin Dept. of Natural Resources, Madison.  
R. Baumeister.  
Wis Dep Nat Resour Tech Bull. 53 p 1-16. 1972. Illus.  
Identifiers: \*Chemical analysis, Copper, Lead, Metals, \*Trace elements, Water supply, Zinc, \*Potable water.

Drinking water supplies utilizing ground and surface water sources were sampled for trace elements in addition to the standard chemical analysis. None of the raw water samples exceeded the Public Health Service Drinking Water Standards for chemical quality, and 1 sample from a distribution system exceeded the standards. The 1 parameter exceeded was Pb (.06 mg/l reported, .01 mg/l higher than the standard) which leached from a service line because of corrosive water in the distribution system. Corrosive water in other systems also caused increased concentrations of Cu and Zn.—Copyright 1973, Biological Abstracts, Inc.  
W73-08424

**THE EXPENDABLE BATHYOXYMETER,**  
Oregon State Univ., Corvallis. Dept. of Oceanography.  
For primary bibliographic entry see Field 07B.  
W73-08438

**ACETONE CONTAMINATION OF WATER SAMPLES DURING QUICKFREEZING,**  
Maryland Univ., Solomons. Natural Resources Inst.  
C. W. Keefe, D. H. Hamilton, and D. A. Flemer.  
Chesapeake Sci. Vol 13, No 3, p 226-229. 1972.  
Identifiers: \*Acetone contamination, \*Freezing, Quick-freezing, Samples, \*Pollutant identification.

Water samples for nutrient concentration analysis 'quick-frozen' in an acetone-dry ice bath may become contaminated with acetone, even though tightly sealed in screw-cap polyethylene bottles. Acetone interferes with oxidation steps in ammonia and total P analyses, as well as the oxidative determination of dissolved organic C. Samples taken for such purposes should not be quick-frozen in an acetone-dry ice bath. Alternatives are discussed.—Copyright 1973, Biological Abstracts, Inc.  
W73-08442

### 5B. Sources of Pollution

**FATE OF TRACE-METALS (IMPURITIES) IN SUBSOILS AS RELATED TO THE QUALITY OF GROUND WATER,**  
Tuskegee Inst., Ala. Carver Research Foundation.  
W. E. Nelson.

Available from the National Technical Information Service as PB-219 401, \$3.00 in paper copy, \$1.45 in microfiche. Tuskegee Institute School of Applied Sciences report, September 1972. 163 p, 77 fig, 66 tab, 48 ref, 1 append. OWRR B-028-ALA (3). 14-01-0001-3053.

Identifiers: \*Heavy metals, \*Path of pollutants, Soil contamination, Animal wastes, Cation exchange, Chelation, \*Soil contamination effects, Chemical precipitation, Diffusion, Groundwater, Adsorption, Manganese, Runoff, Organic matter, Calcium, Potassium, Cobalt, Sodium, Chromium, Lead, Strontium, Magnesium, Water quality.

Laboratory and field studies were conducted to evaluate metal adsorptive capacities of six soils. These and stability constants of soil-metal com-

plexes were used to understand the ability of the soils to complex trace metals, and to explain the leachability or retention of toxic metals by certain soils. Maximum adsorption capacities, relative amounts of metal complexed with one mole of soil, and stability constants (log K values) were calculated from adsorption data of cations retained by soils. The soil-metal adsorption patterns obtained were similar to the Langmuir-Freundlich adsorption isotherms. Adsorption studies indicated that soil complexed metals and renders them insoluble regardless of genesis, organic matter content, and their physicochemical properties. Readiness to complex, however, depends on these properties and the nature of the metal rendered insoluble. Multivalent and divalent and the more electronegative cations make relatively more stable complexes, particularly with soils high in organic matter. Mechanisms mainly responsible for rendering the metals insoluble were considered to be chelation, surface adsorption, precipitation, and diffusion and physical entrapment. Spectral studies were used to investigate the structure of metal ligands and whether complex formation had occurred nondestructively. The laboratory models indicated that the soil has maximum capacity to adsorb metals. However, under field conditions, there was no indication that the maximum capacity was reached. (Warman-Alabama)  
W73-07802

**ORGANIC WASTES AS A MEANS OF ACCELERATING RECOVERY OF ACID STRIP-MINE LAKES,**  
Missouri Univ., Columbia. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 05G.  
W73-07808

**INDUSTRIAL WASTELINE STUDY - A SYSTEM FOR CONTROLLED OCEAN DISPOSAL,**  
Franklin Inst., Philadelphia, Pa. Labs. for Research and Development.  
For primary bibliographic entry see Field 05E.  
W73-07812

**THE CONTEMPORARY STATE OF DECONTAMINATING WASTE WATER,**  
For primary bibliographic entry see Field 05D.  
W73-07835

**PH BUFFERING OF PORE WATER OF RECENT ANOXIC MARINE SEDIMENTS,**  
California Univ., Los Angeles. Dept. of Geology.  
S. Ben-Yaakov.  
Limnology and Oceanography, Vol 18, No 1, p 86-94, January 1973. 3 fig, 2 tab, 20 ref.

Identifiers: \*Hydrogen ion concentration, \*Pore water, \*Connate water, \*Bottom sediments, \*Oxidation-reduction potential, Water chemistry, Biodegradation, Sulfates, Sulfur bacteria, Sulfides, Carbonates, Sea water.  
Identifiers: \*Buffering (pH).

A model is proposed to explain the relative pH stability in pore water of recent anoxic marine sediments. The model assumes that the pH of the pore water is controlled by the byproducts of organic decomposition, sulfate reduction, and precipitation of sulfide and carbonate. The model predicts that the pH of pore waters should remain in the range 6.9 to 8.3, which is in agreement with measured values. (Knapp-USGS)  
W73-07851

**PREDICTING TIME-OF-TRAVEL IN STREAM SYSTEMS,**  
Illinois State Water Survey, Urbana.  
For primary bibliographic entry see Field 02J.  
W73-07879

**EFFECT OF LONGITUDINAL DISPERSION ON DYNAMIC WATER QUALITY RESPONSE OF STREAMS AND RIVERS,**  
Manhattan Coll., Bronx, N.Y. Environmental Engineering and Science Program.  
R. V. Thomann.

Water Resources Research, Vol 9, No 2, p 355-366, April 1973. 11 fig, 4 tab, 8 ref.

Descriptors: \*Dispersion, \*Path of pollutants, Mixing, Advection, Mathematical models, Numerical analysis, Kinetics, Water pollution, Chemical degradation.

The amplitude and phase characteristics of a river subjected to a time variable waste input are computed for two cases: zero dispersion with no mixing and dispersion levels representative of streams and large rivers. The frequency response depends on a set of dimensionless numbers that characterize the reactive and dispersive nature of the river. For upland streams and rivers small amounts of dispersion may be important when the input varies with periods of about 7 days or less. For large, deep rivers the effect of dispersion can generally not be neglected when the input is time variable. Longitudinal dispersion in water quality responses in streams and rivers is analyzed based on frequency response. The analysis provides some guidelines for deciding whether a no-mixing plug flow model is suitable when the problem context involves a time-varying waste input. (Knapp-USGS)  
W73-07890

**BOTTOM CURRENTS IN THE HUDSON CANYON,**  
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.  
For primary bibliographic entry see Field 02E.  
W73-07903

**MOVEMENT OF CHEMICALS IN SOILS BY WATER,**  
Illinois Univ., Urbana. Dept. of Agronomy.  
For primary bibliographic entry see Field 02G.  
W73-07904

**MODELING THE MOVEMENT OF CHEMICALS IN SOILS BY WATER,**  
Illinois Univ., Urbana. Dept. of Agronomy.  
For primary bibliographic entry see Field 02G.  
W73-07905

**A REGIONAL PLANNING MODEL FOR WATER QUALITY CONTROL,**  
Virginia Polytechnic Inst. and State Univ., Blacksburg.  
D. E. Fingay, and A. B. Whinston.  
(1972). 46 p, 2 fig, 7 tab, 71 equ, 1 map, 22 ref. OWRR-B-020-IND (15). Supported by Army Research Office.

Identifiers: Water quality control, \*Water temperature, \*Dissolved oxygen, \*Water pollution treatment, \*Costs, \*Simulation analysis, \*Optimization, Resource allocation, Comprehensive planning, River basins, Regional analysis, Effluents, Economic efficiency, Alternative water use, Biochemical oxygen demand, Thermal pollution, Waste water (Pollution), Cooling towers, Flow augmentation, Constraints, Computer programs, \*Indiana.

Identifiers: \*West Fork White River (Ind.), External effects, Regional planning, Opportunity costs, By-pass piping, Treatment plants, Nonlinear programming.

The information problem when dealing with external effects of water pollution is immense. Usually the external effect (cost or benefit) is transferred to the affected party through a complex series of physical, chemical or biological processes; an in-

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Sources of Pollution—Group 5B

tial effluent discharged by a polluter may affect a downstream user, and in such a case the opportunity costs of a specific resource allocation are not at all clear. This has led to attempts to produce the effects of resource allocation under external effects by modeling the appropriate physical system. Moreover, since different policies are appropriate for different polluters—uniform rules cause significant inefficiencies—a regional approach (thus various treatment strategies) is being considered. Presented is a simulation model of river basin water quality that serves as the constraint for an optimization model which searches for the efficient solutions given the quality goals. The model explicitly considers water temperature and its relationship to dissolved oxygen; it considers simultaneously several treatment strategies and their costs. The model answers: What is the least cost combination of treatment facilities that will meet given temperature and dissolved oxygen goals. Using such a model, a river basin authority could present an assortment of river use and cost combinations for consideration by the affected parties. (Bell-Cornell)

W73-07918

#### SYSTEMS APPROACH TO WATER QUALITY MANAGEMENT,

Water Resources Engineers, Inc., Walnut Creek, Calif.

G. T. Oriob, and B. B. Dendy.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY4, Proceedings paper 9660, p 573-587, April, 1973. 8 fig, 3 ref.

Descriptors: \*Systems analysis, \*Water quality control, \*Groundwater basins, \*Water management (applied), \*Hydraulics, \*California, Optimization, Mathematical models, Economics, Costs, Surface water, Flow, Wells, Aquifers, Data processing, Decision making, Water levels, Dissolved solids.

Identifiers: \*Santa Ana River Basin (Calif), Prado Dam, Orange County Water District, Seawater intrusion.

A strategy is presented for the development of an acceptable plan for the management of a natural water resource where quality control is a primary concern. The strategy embodies many elements of systems analysis and is being applied currently by the Santa Ana Watershed Planning Agency (SAWPA) to a major river basin in Southern California—described in the SAWPA systems approach to evaluation of alternative plans for control of quality in the Santa Ana groundwater basin. The various techniques and tools developed for SAWPA and the proposed scheme for their application are explained. Historic water quality changes are presented and the strategy for assessment of changes predicted by mathematical models is outlined. Models of basin hydrologic behavior and water quality response are used conjunctively with an economic model to find the least costly plan which will produce acceptable quality over the entire basin throughout a 30-year planning horizon. (Bell-Cornell)

W73-07922

#### RADIOACTIVITY OF WASTE WATERS IN NUCLEAR RESEARCH INSTITUTE, REZ, AND ENVIRONMENT, (VLIV RADIOAKTIVITET OD-PADNICH VOD VYZKUMNEHO JADERNEHO CENTRA V KEZI NA OKOLI),

Ceskoslovenska Akademie Ved, Rez, Ustav Jaderneho Vyzkumu.

J. Krepelka, and J. Chysky.

Jaderna Energie Vol 18, No 5, p 146-150, May 1972. 3 fig, 3 tab, 15 ref.

Descriptors: \*Nuclear powerplants, \*Nuclear wastes, \*Radioactive waste disposal, Contaminants, Industrial wastes, Chemical wastes, Water pollution, Water pollution sources, Monitoring, Measurement, Regulation, Assay, River basins.

Identifiers: \*Czechoslovakia.

A system of drainage of liquid wastes and a method of liquidation of radioactive wastes in the Nuclear Research Institute are briefly described. The radioactivity of waste waters discharged into the river is controlled discontinuously. The gross beta-gamma activity is determined in samples. The control also includes a continuous measurement of the activity of chemical wastes discharged separately. Both methods are adequate in view of the isotopes that might be present in a given mixture. In the period of 1963 to 1971, more than 2000 samples were measured. The values obtained were very low, which shows a good function of the liquidation station. No effect on the activity of the river Vltava, into which the wastes were discharged, was found. Therefore, a measurable increase in the exposition by ionizing radiation could not occur in the inhabitants using the Vltava water. The continuous measurement showed several times an accidental uncontrolled discharge of the activity into the chemical drainage and into the river. However, it was found that the maximum permissible concentrations for drinking water could not be exceeded in the river Vltava, which was also proved. (Houser-ORNL)

W73-07926

#### INTERACTION OF YELLOW ORGANIC ACIDS WITH CALCIUM CARBONATE IN FRESH-WATER,

Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.

A. Otsuki, and R. G. Wetzel.

Available from NTIS, Springfield, Va., as COO-1599-63; \$3.00 in paper copy, \$1.45 in microfiche. Report COO-1599-63, 1972. 8 p, 2 fig, 11 ref. AEC-AT (11-1)-1599.

Descriptors: \*Path of pollutants, \*Humic acids, \*Sorption, \*Calcium carbonate, Chemical precipitation, Trace metals, Iron, Carbon cycle, Lakes, Hardness (Water), Carbon radioisotopes, Tracers, Radioactivity techniques, Hydrogen ion concentration, Balance of nature.

In connection with determination of the organic carbon budget of a small hardwater lake, experiments were conducted to determine yellow-acid removal during calcium carbonate precipitation. (Yellow acids are a major part of the soluble humic substances in natural waters.) The results indicated substantial removal of yellow acids and probably of complexed trace metals such as iron by this pathway. It appeared likely that yellow acids were incorporated into crystals both by surface absorption and into crystal nuclei during rapid growth. (Bopp-ORNL)

W73-07931

#### ENVIRONMENTAL RADIOACTIVITY, ISPRA, 1970,

European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.

M. de Bortoli, and P. Gaglione.

Available from NTIS, Springfield, Va., as EUR-4805e; \$3.00 in paper copy, \$1.45 in microfiche. Report EUR-4805e, 1972. 46 p, 8 fig, 23 tab, 2 ref.

Descriptors: \*Fallout, \*Nuclear wastes, \*Europe, \*Food chains, Public health, Path of pollutants, Rivers, Sediments, Lakes, Milk, Freshwater fish, Potable water, Air pollution, Rainfall, Strontium radioisotopes, Absorption.

Identifiers: Cesium radioisotopes.

The abnormally low rainfall for 1970 as compared with 1969 may account for lower deposition by fallout although the radioactivity of the air was higher. In accord with the greater discharge from the Ispra center, Cs137 increased in downstream sediments. In the water of four lakes, Cs137 increased, but Sr90 decreased. In lake fish and in offsite vegetation, Sr90 and Cs137 were the same as in 1969, but were about 10% lower in milk. (Bopp-ORNL)

W73-07933

#### A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. II, COMPUTATION PROCEDURES,

New York City-Rand Inst, N.Y.

J. J. Leenderse, and E. C. Gritton.

Report R-708-NYC, July 1971. 53 p, 13 fig, 8 ref.

Descriptors: \*Mathematical models, \*Water quality, \*Estuarine environment, \*New York, Evaluation, Assessment, Discharge (Water), Effluents, Water quality control, Systems analysis, Research and development, Biological properties, Biochemistry, Water properties, Computer programs, Mixing, Shallow water.

Identifiers: \*Jamaica Bay (Long Island).

This and companion volumes describe methods used and difficulties encountered in designing a simulation model to study the effects of combined sewage overflows and other discharges on Jamaica Bay, Long Island. Basics are reported in Volume 1; preliminary results in Volume 3. This report (Volume 2) describes the design philosophy used in further development, including the addition of a biochemical and biological reaction model. Tidal flow and dispersion, and transport of constituents, are approximated by a system of partial differential equations. The model simulates changes in boundaries that occur in shallow areas of estuaries as a result of the changing tide level. Procedures used to make time-dependent boundary changes have been revised and are outlined. Examples are given of input and output from a computer program. (Bopp-ORNL)

W73-07935

#### ENVIRONMENTAL MONITORING REPORT FOR THE NEVADA TEST SITE JANUARY-DECEMBER 1971.

National Environmental Research Center, Las Vegas, Nev.

Available from NTIS, Springfield, Va., as NERC-LV-539-1, \$3.00 per copy, \$1.45 microfiche. Report No. NERC-LV-539-1, Sept. 1972. 91 p, 7 fig, 7 tab.

Descriptors: \*Monitoring, \*Surveys, \*Radioactivity, \*Testing, \*Assay, \*Evaluation, \*Air pollution, \*Water pollution, Soil contamination, Water pollution sources, Path of pollutants, Public health, Milk, Data collections, Analytical techniques, Sampling, Regulation.

Identifiers: \*Nevada Test Site.

Surveillance of the Nevada Test Site environs during 1971 showed that the concentrations of radioactivity and levels of radiation in the environment were within the Radiation Protection Standards of the Atomic Energy Commission. The surveillance data show that most of the environmental radioactivity in the NTS environs was due to naturally occurring radionuclides and world-wide fallout. Increases in gross beta concentrations in air and increases in Sr89, Sr90, and Cs137 in milk during the late spring and early summer were attributed to the seasonal trend of world-wide fallout. Increases in the gross beta concentrations and measurements of fresh fission products in the air during November at many of the Air Surveillance Network Stations were attributed to the nuclear detonation on November 18, 1971, by the People's Republic of China. (Houser-ORNL)

W73-07936

#### STUDIES ON THE RADIOACTIVE CONTAMINATION OF THE SEA, ANNUAL REPORT, 1971.

Comitato Nazionale per l'Energia Nucleare, La Spezia (Italy). Laboratorio per lo Studio della Contaminazione Radioattiva de Mare.

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5B—Sources of Pollution

Available from NTIS, Springfield, Va., as EUR-4865e; \$3.00 per copy; \$1.45 microfiche. Report EUR-4865e, Aug. 1972. 162 p, 47 fig, 28 tab, 59 ref, 3 annex.

Descriptors: \*Environment, \*Fallout, \*Water pollution, \*Water pollution sources, \*Ecology, \*Ecosystems, Radioecology, Fish, Microorganism, Food chains, Gastropods, Sea water, Algae, Sampling, Analytical techniques, Radioisotopes, Strontium, Cesium, Tritium, Iodine, Assay, Public health.

Identifiers: \*Mediterranean Sea.

The eighth Annual Report of the CNEN-EURATOM Contract of Association is presented. The program laid down in this contract calls for studies of the factors which influence the uptake, accumulation and loss of radioisotopes by different inorganic and organic constituents of the marine environment. The program is divided into two parts: (a) the investigation of relevant radioecological and ecological factors in nature and under laboratory conditions; (b) the investigation of the outfall area off-shore of the CNEN-TRISAIA Centre in the Gulf of Taranto (fuel reprocessing plant). The task of carrying out this program has been divided into six groups: Chemistry, Botany, Zooplankton, Fisheries Biology, Microbiology and Special Developments. Results obtained in 1971 are presented. (Houser-ORNL) W73-07942

#### RESEARCH AND DEVELOPMENT IN PROGRESS, BIOMEDICAL AND ENVIRONMENTAL RESEARCH PROGRAM.

Division of Biomedical and Environmental Research (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as TID-4060, Second Edition; \$6.00 paper copy, \$1.45 microfiche. Report TID-4060, Second Edition, December 1972. 364 p.

Descriptors: \*Research and development, \*Projects, \*Radioecology, \*Radioactivity, Radioactivity techniques, Radioactivity effects, Nuclear wastes, Radioisotopes, Absorption, Marine biology, Estuarine environment, Freshwater, Soil-water-plant relationships, Analytical techniques, Sedimentation, Oceanography, Environmental effects, Path of pollutants.

Summaries of 1473 projects are presented in the form furnished by the investigators to the Science Information Exchange of the Smithsonian Institution. In addition to listing by category, indexing is by contractor, investigator, and subject. The categories dealing with radionuclides in the environment include (numbers of summaries in parentheses): terrestrial systems (70), soils and soil-plant relations (56), freshwater systems (45), transport in soil, food and man (17), analytical procedures (8), radionuclide uptake in marine systems (23), sedimentation and chemical interactions (17), circulation and mixing (11), and other oceanographic studies (8). (Bopp-ORNL) W73-07943

#### CONTINUOUS MEASUREMENT OF ALPHA AND BETA RADIOACTIVITY OF WATER IN VIEW OF MAXIMUM PERMISSIBLE CONCENTRATIONS FOR THE PUBLIC.

Commissariat a l'Energie Atomique, Saclay (France).

For primary bibliographic entry see Field 05A. W73-07945

#### RADIONUCLIDE CYCLING IN TERRESTRIAL ENVIRONMENTS.

Oak Ridge National Lab., Tenn.

R. C. Dahlman, E. A. Bondietti, and F. S. Brinkley.

Available from NTIS, Springfield, Va., as ORNL-4848; \$3.00 paper copy; \$1.45 microfiche. In: Environmental Sciences Division Annual Progress Report for Period Ending September 30, 1972, ORNL-4848, February 1973, p 1-8, 3 fig, 1 tab, 4 ref.

Descriptors: \*Nuclear wastes, \*Radioecology, \*Soil-water-plant relationships, \*Soil microorganisms, Soil fungi, Soil bacteria, Analytical techniques, Cadmium, Fallout, Zinc, Leaching, Litter, Sulfur, Soil contamination, Radiochemical analysis, Plant physiology, Root zone, Leaves, Foliar application, Food chains, Path of pollutants, Insects, Birds, Forests, Trace elements, Cycling nutrients, X-ray diffraction, Waste water (Pollution), Algae, Cobalt radioisotopes.

Co60 uptake by millet plants was several orders of magnitude less from soil contaminated for 25 years as compared to soil contaminated about 6 months. By density-gradient-centrifugation analysis, a large part of the Co60 (as well as Ru106 and Sb125) was shown to be in roots, 33% through rainfall and leaf drop. Soil microbial activity decreased mobility of Zn, Cd and S; but not that of N. By microbial action, leaching of cadmium nitrate from soil was increased; leaching from sand was decreased. Algae and detritus absorbed cadmium oxide more readily than cadmium nitrate. Radioecological studies were made of Cd turnover in arthropods and in birds. Effects of sodium on clay aggregation were studied by x-ray diffraction. Pu was determined in soil by a rapid amine-chelation method. The adenosine triphosphate in fungal mass was correlated with other growth-rate parameters. (Bopp-ORNL) W73-07946

#### APPLIED AQUATIC STUDIES,

Oak Ridge National Lab., Tenn.

B. G. Blaylock, C. P. Allen, and M. Frank.

Available from NTIS, Springfield, Va., as ORNL-4848; \$3.00 paper copy, \$1.45 microfiche. In: Environmental Sciences Division Annual Progress Report for Period Ending September 30, 1972, ORNL-4848, February 1973, p 79-85, 2 fig, 2 tab, 11 ref.

Descriptors: \*Path of pollutants, \*Radioactivity, \*Radioisotopes, \*Nuclear wastes, Sediments, Absorption, Freshwater fish, Tritium, Radioactivity effects, Water pollution effects, Fish eggs, Chromium, Toxicity, Hatching, Chlorination, Water treatment, Chromosomes, Larvae, Radioecology, Water pollution sources, Sewage treatment, Waste water (Pollution), Soil contamination, Cobalt radioisotopes, Catfishes, Potable water.

Identifiers: Cesium radioisotopes.

The maximum gamma activity (62.86% Cs137) is now found at a depth of 16-34 cm in the sediment of a holding pond as a result of a decrease in the radioactivity of waste-water discharges. Biological half-lives for elimination of tritium from fish kept in the pond for 36 days were: for tritium in body water, 0.2 hr and 0.9 hr; for tritium in tissue, 8.7 days. Natural populations of insect larvae (C. tentans) in the pond were unchanged in chromosomal polymorphism (1960-1973). After exposure to 1500 rads of Co60 irradiation, some catfish survived for 98 days at 15 C, for 32 days at 25 C; none for 8 days at 30 C. Contamination of water with 1-10 ppm Cr greatly increased the time to hatching of fish eggs. An attempt is being made to study the production of chlorinated organics during purification of natural waters by a Cl-36 tracer-gas chromatographic method which was successful in a study of the chlorination of primary sewage effluent. (Bopp-ORNL) W73-07948

#### HYDROLOGIC INVESTIGATIONS AND THE SIGNIFICANCE OF U-234/U-238 DIS-

EQUILIBRIUM IN THE GROUND WATERS OF CENTRAL TEXAS,

Rice Univ., Houston, Tex.

J. Kronfeld.

Available from Univ. Microfilm, Ann Arbor, Mich., No. 72-26,442 \$10.00 paper copy, \$4.00 microfiche. Ph. D. Dissertation, July 1971, 78 p, 10 fig, 2 tab, 35 ref.

Descriptors: \*Radioisotopes, \*Uranium, \*Analytical techniques, \*Assay, \*Water analysis, \*Groundwater, \*Aquifers, \*Surface waters, \*Uranium radioisotopes, Radioactive tracers, Sands, Soils, \*Texas.

Identifiers: \*Trinity aquifer.

Forty-six uranium isotopic analyses were made using alpha spectrometry on waters from the deep Trinity aquifer as well as upon surface waters in central Texas. Most of the surface waters have U-234/U-238 alpha-activity ratios clustering between 1.15 and 1.40. The subsurface waters exhibit extreme isotopic fractionation, being enriched in U-234 between several hundred and twelve hundred percent. The uranium content of the subsurface water is less than surface water, the majority falling around 0.02 and 0.04 parts per billion. The most extreme fractionation occurs immediately down-dip from the recharge area. From there the activity ratio decreases down-dip as a function of the half-life of U-234. There is a corresponding, though non-uniform, decrease in the total uranium content down-dip. The Trinity aquifer affords a closed system to an isotope dilution study that utilizes natural U-234/U-238 disequilibrium as a hydrologic tracer. Rates of water flow so derived, 0.7 to 3.0 ft/d, are consistent with the transmissibility values of the aquifer rocks. Laboratory leaching of uranium from the soils and aquifer sand yield U-234/U-238 activity ratios that are very similar to uranium isotopic compositions of surface waters. No extreme fractionation was found in the solid phases. (Houser-ORNL) W73-07949

#### FALLOUT PROGRAM QUARTERLY SUMMARY REPORT, SEPTEMBER 1, 1972 - DECEMBER 1, 1972,

New York Operations Office (AEC), N.Y. Health and Safety Lab.

For primary bibliographic entry see Field 05A. W73-07950

#### APPENDIX TO QUARTERLY SUMMARY REPORT, SEPT. 1, 1972, THROUGH DEC. 1, 1972.

#### HEALTH AND SAFETY LABORATORY, FALLOUT PROGRAM,

New York Operations Office (AEC), N.Y. Health and Safety Lab.

For primary bibliographic entry see Field 05A. W73-07951

#### RADIOACTIVE EFFLUENTS FROM NUCLEAR POWERPLANTS (BETRIEBLICHE ABLEITUNGEN GEN RADIÖAKTIVER STOFFE AUS KERN-TECHNISCHEN ANLAGEN).

Technischer Ueberwachungs-Verein e. V., Cologne (West Germany). Institut fuer Reaktorsicherheit.

For primary bibliographic entry see Field 05D. W73-07952

#### ENVIRONMENTAL RADIOACTIVITY IN GREENLAND IN 1971,

Danish Atomic Energy Commission, Risoe Health Physics Dept.

A. Aarkrog, and J. Lippert.

Available from NTIS, Springfield, Va., as RISO-267, \$3.00 per copy, \$1.45 microfiche. Report No. RISO-267, July 1972. 18 p, 4 fig, 11 tab, 4 ref.

Descriptors: \*Measurement, \*Fallout, \*Radioactivity, \*Assay, \*Strontium, \*Cesium, Sea water,

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Sources of Pollution—Group 5B

Precipitation (Atmospheric), Vegetation, Potable water, Environment, Potable water, Food chains, Diets, Toxicity, Public health, Human pathology, Data.

Identifiers: \*Greenland.

Measurements of fall-out radioactivity in Greenland in 1971 are reported. Sr-90 (and Cs-137 in most instances) was determined in samples of precipitation, sea water, vegetation, animals, and drinking water. Estimates of the mean contents of Sr-90 and Cs-137 in the human diet in Greenland in 1971 are given. Also reported is the mean level of strontium in human bone in Greenland. (Houser-ORNL)

W73-07953

**CHALK RIVER NUCLEAR LABORATORIES PROGRESS REPORT APRIL 1 TO JUNE 30, 1972, BIOLOGY AND HEALTH PHYSICS DIVISION, ENVIRONMENTAL RESEARCH BRANCH AND HEALTH PHYSICS BRANCH, Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.**

For primary bibliographic entry see Field 05C.  
W73-07955

**COLUMBIA RIVER EFFECTS IN THE NORTHEAST PACIFIC: PHYSICAL STUDIES. REPORT OF PROGRESS, JUNE 1971 THROUGH JUNE 1972.**  
Washington Univ., Seattle. Dept. of Oceanography.

For primary bibliographic entry see Field 02J.

W73-07956

**RADIONUCLIDE DISTRIBUTION IN SOIL MANTLE OF THE LITHOSPHERE AS A CONSEQUENCE OF WASTE DISPOSAL AT THE NATIONAL REACTOR TESTING STATION.**  
Idaho Operations Office (AEC), Idaho Falls.

Available from NTIS, Springfield, Va., as IDO-10049, \$3.00 paper copy, \$1.45 microfiche. Report No. IDO-10049, Oct. 1972. 80 p., 18 fig., 27 tab., 34 ref., 4 append.

Descriptors: \*Radioactive waste disposal, \*Water pollution, \*Water pollution sources, \*Soil contamination, \*Assay, Cobalt, Strontium, Plutonium, Lake bed, Ponds, Leaching, Migration, Movement, Distribution patterns.

The distribution of radionuclides in the soil resulting from disposal of liquid and solid waste at the National Reactor Testing Station (NRTS) was studied. The situation involving liquid waste is appraised by: (a) mathematical models using parameters determined in the laboratory; (b) physical models using soil samples and simulated waste solution; and (c) sampling of soil and water where waste is being discharged. In case of strontium-90, the data indicate that the sorption capacity of the alluvial deposits between the disposal pond bottoms and the basalt bedrock has been reached. The data for cesium were erratic but the most pessimistic interpretation indicates that the capacity of the alluvium has not been reached. The amount of cobalt-60 estimated to be in the alluvium is greater than that reported to have been discharged. The discharge estimates do not take into account the more frequent usage of unheated cobalt wires for neutron flux measurements during the early history of the reactors. Cobalt-60 retention in the soil is attributed to reactions other than ion-exchange. A hypothetical evaluation is included of the environmental problems remaining after active operation of a disposal site has been discontinued. It is concluded that disposal sites can be used for other purposes with certain restrictions. (Houser-ORNL)

W73-07958

**DETERMINATION OF TRACE METALS AND FLUORIDE IN MINERALOGICAL AND BIOLOGICAL SAMPLES FROM THE MARINE ENVIRONMENT.**  
Naval Research Lab., Washington, D.C. For primary bibliographic entry see Field 05A.

W73-07959

**RADIOACTIVITY AND WATER SUPPLIES,**  
Internationaal Reactor Instituut, Delft (Netherlands).

For primary bibliographic entry see Field 05D.  
W73-07960

**EVENT-RELATED HYDROLOGY AND RADIONUCLIDE TRANSPORT AT THE CANNIKIN SITE, AMCHITKA ISLAND, ALASKA.**  
Nevada Univ., Reno. Desert Research Inst.

P. R. Fenkse.  
Available from NTIS, Springfield, Va., as NVO-1253-1; \$3.00 paper copy, \$1.45 microfiche. Report NVO-1253-1, 1972. 37 p., 17 fig., 21 ref.

Descriptors: \*Nuclear wastes, \*Nuclear explosions, \*Tritium, \*Alaska, Path of pollutants, Fracture permeability, Permeability, Oceans, Saline water-freshwater interfaces, Water properties, Retention, Retardance, Conductivity, Fluctuations, Radioisotopes, Absorption, Groundwater movement, Darcys Law, Ion uptake, Soil contamination effects, Analog models, Aquifer characteristics.

Evaluation of possible ground-water contamination from the Cannikin site involved consideration of thermal effects in the rubble chimney, ground-water transit time along probable flow paths, and the rate of dilution of fresh-water seepage with sea water. Measurements of temperature and pressure in test holes and water analyses were used to locate the freshwater-saltwater interface. The hydraulic conductivity was estimated from the response in test holes to barometric and tidal fluctuations. Electrical analogue simulation of the hydraulic conductivity of fracture networks gave a residence time of 14,000 years for the underlying saline aquifer. The transit time through the fresh-water lens to the sea is about 3000-4000 years—such that tritium is eliminated by radioactive decay. (Bopp-ORNL)

W73-07961

**TERRESTRIAL AND FRESHWATER RADIOPHYSICS, A SELECTED BIBLIOGRAPHY, SUPPLEMENT 8,**  
Washington State Univ., Pullman. Dept. of Zoology.

For primary bibliographic entry see Field 05C.  
W73-07962

**CONTRIBUTION TO THE STUDY OF THE MIGRATION OF RU106 IN SOILS,**  
Commissariat à l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucléaires.

J. P. Amy.

Available from NTIS, Springfield, Va., as RFP-Trans-113; \$3.00 in paper copy, \$1.45 cents in microfiche. Report RFP-Trans-113, 1972. 4 p.

Descriptors: \*Nuclear wastes, \*Irrigation water, \*Soil contamination, \*Radioisotopes, Sorption, Permeability, Soil types, Soil chemical properties, Hydrogen ion concentration, Physicochemical properties, Hydrolysis, Ion transport, Ion exchange, Leaching, Movement, Absorption, Path of pollutants.

Ru106 mobility was studied in agricultural soils irrigated with Rhine water at one time contaminated by nuclear wastes. Its many chemical forms make the behavior of Ru complex. Nitrodnitrate complexes which exhibit mainly cationic characteristics resemble Cs, but an anionic component

which increases with increasing acidity is less readily adsorbed. Minimum mobility is found for soil that is calcareous, clayey, of low permeability and rich in organic matter. Artificial augmentation of the alkalinity of an acid soil augments sorption. (Bopp-ORNL)

W73-07963

**DISTRIBUTION OF RADIONUCLIDES IN ORGANISMS OF MARINE FAUNA. APPLICATION OF CRITICAL CONCENTRATION FACTORS,**  
A. Ya. Zesenko.

Available from NTIS, Springfield, Va., as Part of AEC-tr-7299; \$6.00 in paper copy, \$1.45 microfiche. In: Marine Radioecology, p 105-146, Trans. from Morskaya Radioekologiya, 1970.

Descriptors: \*Bioindicators, \*Fallout, \*Nuclear wastes, \*Marine animals, Path of pollutants, Estuarine environment, Animal metabolism, Radioecology, Salt water, Oceans, Mollusks, Marine fish, Crabs, Radioisotopes, Absorption, Crustaceans, Trace elements, Tracers.

A series of studies is reviewed on uptake of radionuclides (Ag10, Zn65, Y91, Ce144, Zr95, Nb95, P32, S31, Ru106, Cu106) by organisms of marine organisms (fish, mussels, grass crabs). Gills, byssus, shell, and chitinous skin (crustaceans) are indicators of uptake of certain radionuclides (Ag10, Cs137, Zn65, Sr90, Y91, Ce144, Zr95, Nb95, Ru106). Filtration by marine mollusks is of slight effectiveness for uptake of Y91, Ce144, Zr95, Nb95, or Ru106. (Bopp-ORNL)

W73-07966

**ACCUMULATION OF RADIONUCLIDES BY ROE AND LARVAE OF BLACK SEA FISH,**  
V. N. Ivanov.

Available from NTIS, Springfield, Va., as Part of AEC-tr-7299; \$6.00 in paper copy, \$1.45 in microfiche. In: Marine Radioecology, Translation from Morskaya Radioekologiya, 1970, p 147-157, 3 fig., 1 tab., 10 ref.

Descriptors: \*Radioisotopes, \*Absorption, \*Larval growth stage, \*Marine fish, Food chains, Public health, Path of pollutants, Laboratory tests, Nuclear wastes, Fallout, Hatching, Water pollution effects, Strontium radioisotopes.

Identifiers: Zirconium radioisotopes, Cesium radioisotopes, Yttrium radioisotopes, Ruthenium radioisotopes.

Radiouclide concentration factor ranges for several species (IA) for newly hatched larvae and (b) for eggs before hatching are: - Zr: a, 34-43; b, 14-35. Cs: a, 10; b, 9. Sr: a, 1.3-1.7; b, 0.9-4.4. Y: a, 0.5-1.1; b, 57-233. Ce: a, 1-4; b, 22-495. Ru: a, 0.5-3.6; b, 12-21. More-limited data are given for C, P, S, Mn, Fe, Co, and W. Concentration factors for older larvae were several-fold higher than for newly hatched larvae with Zr, Cs, Sr, Ce, Y, and Ru. Absorption on the exterior of the egg membrane is believed to account for the relatively high uptake of Y and Ce. (Bopp-ORNL)

W73-07967

**EFFECT OF INCORPORATED RADIONUCLIDES ON CHROMOSOME APPARATUS OF OCENA FISH,**  
V. G. Tsytsgina.

Available from NTIS, Springfield, Va., as AEC-tr-7299; \$6.00 in paper copy, \$1.45 microfiche. In: Marine Radioecology, p 157-165. Translation from Morskaya Radioekologiya, 1970, 1 fig., 4 tab., 18 ref.

Descriptors: \*Nuclear wastes, \*Marine fish, \*Larval growth stage, \*Chromosomes, Cytological studies, Water pollution effects, Radioactivity effects, Fallout, Hatching, Radioisotopes, Absorption, Strontium radioisotopes, Carbon radioisotopes.

Identifiers: Yttrium radioisotopes.

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5B—Sources of Pollution

Ruff and flounder embryo from eggs reared in sea water containing above 10 nanoCuries/liter Sr89 and 180 nanoCuries/liter of C14 showed increased chromosome breaks relative to controls. That increasing the radioactivity several orders of magnitude produced little or no additional effect is explained by the relatively high sensitivity of the initial growth stage, by effects from nonviable aberrations, and perhaps by acceleration of mutation processes in exposed cells. Increased chromosome breaks in 1-day-old flounder larvae resulted from hatching in seawater containing 0.3 nanoCurie/liter Y91. (Bopp-ORNL) W73-07968

#### RADIOECOLOGICAL STUDIES ON THE DANUBE RIVER AND ADJOINING PART OF THE BLACK SEA,

V. I. Timoshchuk, and I. A. Sokolova.

Available from NTIS, Springfield, Va., as AEC-tr-7299; \$6.00 paper copy, \$1.45 microfiche. In: Marine Radioecology, p 174-185. Translation from Morskaya Radioekologiya, 1970, 5 fig, 1 tab, 16 ref.

Descriptors: \*Estuarine environment, \*Marine fish, \*Strontium radioisotopes, \*Absorption, Path of pollutants, Fallout, Nuclear wastes, Radioecology, Oceans, Freshwater fish, Mussels, Fish migration, Geomorphology, Climatology, Europe, On-site data collections, Food chains, Sea water, Water analysis.

The geomorphology and climatology are reviewed of the Danube River, its coastal regions, and the northwestern part of the Black Sea. Sr90 concentration (in units of picoCuries/liter) was measured in April 1966, 1967, at the delta head (2.40, 1.75 units) and 50 miles offshore, where the value (0.6-0.8 unit) is typical of the Black Sea. Concentration factors for Sr90 uptake were: Danube fish (carp, rudd), 43-102; semimigratory fish (pike-perch, common carp), 12-26; migratory fish and herring, 7; mussels, including the shell, 50-617. (Bopp-ORNL) W73-07969

#### Sr IN WATER OF THE CASPIAN AND AZOV SEAS,

V. I. Timoshchuk.

Available from NTIS, Springfield, Va., as Part of AEC-tr-7299; \$3.00 in paper copy, \$1.45 in microfiche. In: Marine Radioecology, Translation of Morskaya Radioekologiya, 1970, p 185-196. 8 fig, 2 tab, 10 ref.

Descriptors: \*Strontium radioisotopes, \*Absorption, \*Marine fish, \*Nuclear wastes, Fallout, Path of pollutants, Food chains, Strontium, Estuarine environment, Migration, Fish behavior, Public health, Saline water fish, Salinity, Leaching, Salt balance, Water pollution effects, Sedimentary rocks, Chemical precipitation, Evaporation, Inflow, Mixing.

Identifiers: USSR, Sea of Azov, Black Sea, Caspian Sea.

Leaching of shoreline rocks gives high Sr concentration (21-25 mg/liter) in certain regions of the Caspian Sea relative to regions diluted by river discharges (0.5-2.5 mg/liter). Sr in the Sea of Azov (3.1-6.1 mg/liter) is affected by exchange with the Sivash Bay where evaporation gives high Sr concentrations (26 mg/liter). Concentration factors for Sr90 measured in 1966 were higher for semimigratory fish (roach, 40; carp, 33) than for migratory fish (kutum, 2.5). (Bopp-ORNL) W73-07970

#### Sr90 IN AQUATIC ORGANISMS OF THE BLACK SEA,

V. P. Parchevskii, L. G. Kulebakina, I. A.

Sokolova, and A. A. Bachurin.

Available from NTIS, Springfield, Va., as Part of AEC-tr-7299; \$6.00 paper copy, \$1.45 microfiche.

In: Marine Radioecology, p 196-221, Translation of Morskaya Radioekologiya, 1970, 21 tab, 30 ref.

Descriptors: \*Strontium radioisotopes, \*Radioecology, \*Estuarine environment, \*Marine algae, Fallout, Nuclear wastes, Path of pollutants, Absorption, Marine plants, Marine fish, Marine animals, Mollusks, Crustaceans, Europe, Plant physiology, Crabs, Radioactivity techniques, Marine biology, Foreign research, Oceans, Water analysis, Basic data collections, On-site data collections, Seasonal, Food chains, Sea water, Water analysis.

Studies in 1965-1966 showed low variability in Sr90 uptake within the same species. Of the total Sr90 in plant communities and in water in the vicinity, the percentage absorbed by the plants varied according to species (Cystoseira brown alga, 30%; Caralia red alga, 23%; Paderia brown alga, 17%; Zostera flowering plant, 11%; other algae, 1%); Cystoseira bioconcentration that includes animals and other plants, (40%). For Cystoseira samples in Sept. 1964 and Dec. 1965, Sr90 concentration was about twice as high in the stem as in the branches; but in July 1965 there was no difference (a seasonal effect). Sr/Ca atomic ratios were nearly the same in organisms from related taxonomic groups and agreed with values obtained by others. Isotopic exchange between Sr90 and Sr was nearly complete. (Bopp-ORNL) W73-07973

#### MN, CU AND ZN IN WATER AND ORGANISMS OF THE SEA OF AZOV,

L. I. Rozhanskaya.

Available from NTIS, Springfield, Va., as Part of AEC-tr-7299; \$6.00 paper copy, \$1.45 microfiche. In: Marine Radioecology, p 222-255, Translation of Morskaya Radioekologiya, 1970, 9 fig, 9 tab, 50 ref.

Descriptors: \*Trace elements, \*Absorption, \*Radioecology, \*Marine algae, Marine fish, Phytoplankton, Zooplankton, Strontium radioisotopes, Copper, Zinc, Path of pollutants, Marine plants, Reduction (Chemical), Oxygen demand, Seasonal, Trace elements, Manganese, Estuarine environment, Fallout, Biomass, On-site data collections, Europe.

Results are compared with similar studies in other seas. Mn in near-bottom water varied with season and location and was inversely related to the oxygen content. The average Cu/Zn ratio was 0.39. Phytoplankton, zooplankton, and benthic organisms had generally higher concentration factors for trace elements (Mn, 200-10,000; Cu, 250-3,000; Zn, 500-7,000) than fish (Mn, 30-400; Cu, 150-700; Zn, 700-1,800). Migration of Sr90 in coastal zones is affected by absorption into the macrophyte biomass. (Bopp-ORNL) W73-07972

#### RADIOECOLOGY OF CENTRAL AMERICAN SEAS,

G. G. Polikarpov, Yu. P. Zaitsev, V. P.

Parchevskii, A. A. Bachurin, and I. A. Sokolova.

Available from NTIS, Springfield, Va., as Part of AEC-tr-7299; \$3.00 in paper copy, \$1.45 in microfiche. In: Marine Radioecology, p 256-288, Translation of Morskaya Radioekologiya, 1970, 20 fig, 14 tab, 6 ref.

Descriptors: \*Radioisotopes, \*Absorption, \*Marine biology, \*Radioecology, Nuclear wastes, Path of pollutants, Strontium radioisotopes, Atlantic Ocean, Marine algae, Kelp, Plankton nets, Benthic flora, Zooplankton, Vertical migration, Rhodophyta, Phaeophyta, Chlorophyta, Fallout. Identifiers: Caribbean Sea, Cerium radioisotopes, Ruthenium radioisotopes, Cesium radioisotopes, Sargassum.

Plankton and benthic algae (collected from the Caribbean during April through August 1965) were analyzed by gamma spectroscopy. The principal radionuclides present in the macrophyte Sargassum natans were: Ce144 (93%), Mn54 (3.6%), Ru106 (3.1%), and Sr90 (0.3%); in the benthic brown alga Padina vickeviae, Ce144 (Ru106 and Mn54 were absent). A significant part of the radioactivity in the water and organisms of the upper layers of the Sargasso sea is in Sargassum Macrophytes (70% of the Ce144, 40% of the Ru106, 7% of the Sr90, 3% of the Cs137). In experiments in aquaria, concentration factors were determined for several species of algae (Ce144, 200-1700; Ru106, 140-520; Sr90, 0.5-41; Cs137, 7-15); for individual organs of macrophytes; for zooplankton; and for other marine organisms. Rates of radionuclide uptake were measured. (Bopp-ORNL) W73-07973

#### RADIOBIOLOGICAL RESEARCH IN OCEANS AND GENERALIZATIONS IN MARINE RADIOECOLOGY,

V. P. Parchevskii, I. A. Sokolova, G. G.

Polikarpov, and A. A. Bachurin.

Available from NTIS, Springfield, Va., as Part of AEC-tr-7299; \$3.00 in paper copy, \$1.45 in microfiche. In: Marine Radioecology, p 292-324, Translation of Morskaya Radioekologiya, 1970, 3 fig, 10 tab, 15 ref.

Descriptors: \*Nuclear wastes, \*Fallout, \*Marine biology, \*Marine fish, Strontium radioisotopes, Absorption, Path of pollutants, Sea water, Freshwater, Water properties, Alkalinity, Carriers, Radioisotopes, Radioactivity, Food chains, Foreign research, On-site investigations, Public health, Stable isotopes, Nutrient requirements, Water pollution sources, Mollusks.

When isotopic or non-isotopic carriers remain constant, radionuclide uptake by aquatic organisms is given by concentration factors (ratio of radioactivity of organism to that of an equal weight of water) which are independent of the radionuclide concentration in the water in the range 1-100 picromoles/liter. Sr90 uptake by related organisms is about 2-fold higher in the Black Sea than in most other oceans or seas which have lower Ca content. Uptake of Cs137, Sr90, and Sr35 is about an order of magnitude higher in fresh water than in sea water, corresponding to the higher carrier content of sea water. Data obtained during 1961-1966 on Sr90 in marine organisms (in units of picoCuries/kg) is reviewed. Values for various species of fish ranged from 1 to 10. Pollution by nuclear wastes caused higher values for brown algae in the Irish Sea (10-600) than in most other seas and oceans (1-3). (Bopp-ORNL) W73-07974

#### SOME ASPECTS OF THE QUANTITATIVE ECOLOGY OF MERCURY,

Swedish Water and Air Pollution Research Lab., Stockholm.

T. Fagerstrom, and A. Jernelov.

Water Research, Vol 6, No 10, p 1193-1202, October 1972, 5 fig, 26 ref.

Descriptors: \*Mercury, \*Path of pollutants, \*Ecosystems, Aquatic environment, \*Model studies, Heavy metals, Chelation, Organic matter, Oxidation, Oxidation-reduction potential, Clay minerals, Physicochemical properties, Environmental effects, Reduction (Chemical).

Identifiers: Transformation, \*Organomercury compounds, \*Mercury compounds, Mercuric sulfide, Metal complexes, Methylmercury, Dimethylmercury, Fate of pollutants, Biotransformation, Transport.

The principal ways of transformation of mercury in aquatic ecosystem are discussed. The mercury transformations include: (1) formation of HgS, (2)

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Sources of Pollution—Group 5B

conversion of  $HgS$ , (3) formation and oxidation of elementary  $Hg$ , (4) formation of complexes between divalent mercury and organic substances and the release of  $Hg$  therefrom, (5) formation of mercury-inorganic material complexes of the silicate and ferro-manganese-type, (6) release of soluble mercury from complexes, and (7) formation and degradation of methylmercury and dimethylmercury. The quantitative influences on these processes of some physico-chemical and biological factors are demonstrated from field investigations and laboratory experiments. A dynamic model for the transport of methylmercury in a simplified limnic food-chain is outlined. (Holoman-Battelle)  
W73-08013

**BIOLOGICAL EFFECTS AND PHYSICAL PROPERTIES IN THE MARINE ENVIRONMENT OF ALIPHATIC CHLORINATED BY-PRODUCTS FROM VINYL CHLORIDE PRODUCTION,**  
Swedish Water and Air Pollution Research Lab.,  
Goteborg.  
For primary bibliographic entry see Field 05C.  
W73-08014

**BACTERIAL CHEMORECEPTION: AN IMPORTANT ECOLOGICAL PHENOMENON INHIBITED BY HYDROCARBONS,**  
Harvard Univ., Cambridge, Mass. Lab. of Applied Microbiology.  
For primary bibliographic entry see Field 05C.  
W73-08016

**THE LOAD OF INFECTIOUS MICRO-ORGANISMS IN THE WASTE WATER OF TWO SOUTH AFRICAN HOSPITALS,**  
National Inst. for Water Research, Pretoria (South Africa).

W. O. K. Grabow, and E. M. Nupen.  
Water Research, Vol 6, No 12, p 1557-1563, December 1972. 2 tab, 30 ref.

**Descriptors:** \*Sewage effluents, Waste water (Pollution), Hospitals, \*Municipal wastes, Water pollution sources, \*Worms, \*Animal parasites, \*Bacteria, \*Viruses, \*Pathogenic bacteria, Enteric bacteria, Sampling, Microorganisms, E. coli, Salmonellae, Coliforms, Shigella, Pseudomonas, Sewage bacteria, Invertebrates, Clostridium, Water sampling, Nematodes.  
**Identifiers:** Enterovirus, Eggs, Reovirus, Tapeworms, Pseudomonas aeruginosa, Ascaris, Taenia, Flatworms, Platyhelminthes, Trichuris, Clostridium perfringens, Staphylococci, Salmonella sp.

Counts of microorganisms including infectious bacteria, viruses and parasite ova in the waste water of two hospitals were compared with those in city sewage. One of these is an isolation hospital with stringent disinfection procedures. Grab samples were taken at hourly intervals over 24-hour periods, and individual samples were immediately cooled to 4°C and pooled. The waste water of each hospital and the city's sewage effluent were sampled simultaneously. Prior to analysis, samples were homogenized in a mixer for 4 min at a speed selector setting of 4. Some of the bacterial counts included total coliforms, *Clostridium perfringens*, *Salmonellae*, fecal streptococci, *Pseudomonas aeruginosa*, confirmed *E. coli* I; the viral counts were of enter- and reoviruses, and those of parasite ova were for *Ascaris*, *Taenia*, *Trichuris*, and *Neatora* or *Ancylostoma*. Counts of all the organisms tested, except *Pseudomonas aeruginosa*, were lower in the waste water of this hospital than in the sewage effluent of the town in which it is located. The other hospital is a general hospital with less stringent disinfection procedures. Counts of some organisms were slightly higher in the waste water of this hospital than in the sewage effluent of the city in which it is located. The results obtained indicated that under normal conditions

the waste water of hospitals needs no treatment before disposal into city sewers. The disposal of primary treated hospital effluents into streams or their use for irrigation should, however, be considered with care. (Holoman-Battelle)  
W73-08024

**CHEMICAL COMPOSITION OF WATER OF STREAMS OF POLISH HIGH TATRA MOUNTAINS, PARTICULARLY WITH REGARD TO THE SUCHA WODA STREAM,**  
Polish Academy of Sciences, Krakow. *Zaklad Biologii Wod*.

Acta Hydrobiol, Vol 13, No 4, p 379-391, 1971. Illus.

**Identifiers:** \*Chemical composition, Climate, \*Mountain streams, Pollution, Streams, Sucha, \*Tatra mountains, Woda.

The chemical composition of water depends on the geological structure of the drainage area, hypsometric differences, and the climate related with them. Owing to this, trophically varying types of waters develop within very short basins. Attention is also drawn to the local pollution of pure high-mountain streams in the region of shelter-houses and settlements.—Copyright 1972, Biological Abstracts, Inc.  
W73-08026

**WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS: A PROGRESS REPORT,**  
National Sanitation Foundation, Ann Arbor, Mich.  
For primary bibliographic entry see Field 05A.  
W73-08027

**HETEROTROPHIC NITRIFICATION IN SAMPLES OF NATURAL ECOSYSTEMS,**  
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.

W. Verstraete, and M. Alexander.  
Environmental Science and Technology, Vol 7, No 1, p 39-42, January 1973. 1 fig, 6 tab, 14 fig.

**Descriptors:** \*Nitrification, \*Ecosystems, \*Aqueous bacteria, \*Aqueous environment, Nitrogen compounds, Sewage sludge, Freshwater, Nitrates, Rivers, Aquatic soils, Cultures.

**Identifiers:** Enrichment, Arthrobacter, Heterotrophic bacteria, Hydroxylamine, 1-Nitrosoethanol, Hydroxamic acid.

Since studies of axenic cultures of a nitrifying strain of *Arthrobacter* revealed that hydroxylamine, hydroxamic acid, 1-nitrosoethanol, nitrate, and nitrite were excreted, an investigation was begun to determine whether this or physiologically related species could bring about the same type of nitrification in natural environments. Products of the reaction and their persistence in samples taken from several different ecosystems were also determined. Samples (200 ml) of different aquatic environments (sewage, river water, lake water, soil) were enriched with sodium acetate and ammonium sulfate to concentrations of 3.0 mg C/ml and 1.0 N/ml and incubated on a rotary shaker (120 rpm). Hydroxylamine, 1-nitrosoethanol, nitrite, and nitrate were formed in samples of sewage, river water, lake water, and soils amended with ammonium and acetate. A carbon source was needed for the occurrence of this pattern of nitrification, which is apparently heterotrophic. Of the carbon sources tested, only acetate and succinate supported this newly described kind of nitrification. The data suggest that the active microorganisms nitrify at neutral pH values under conditions which do not promote abundant growth of other heterotrophs, but in environments that allowed luxuriant microbial proliferation, these microorganisms competed successfully and nitrified only at alkaline pH values. Hydroxylamine was rapidly

inactivated in sewage and in soil, whereas 1-nitrosoethanol was quite persistent in aqueous solutions but disappeared rapidly from soil. (Holoman-Battelle)  
W73-08029

**MIREX RESIDUES IN WILD POPULATIONS OF THE EDIBLE RED CRAWFISH (PROCAMBARUS CLARKII),**

Animal and Plant Health Inspection Service, Gulfport, Miss. Plant Protection and Quarantine Programs.

For primary bibliographic entry see Field 05A.  
W73-08030

**METABOLISM OF DDT BY FRESH WATER DIATOMS,**

Manitoba Univ., Winnipeg. Dept. of Entomology.

S. Miyazaki, and A. J. Thorsteinson.  
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 2, p 81-83, August, 1972. 1 tab, 13 ref.

**Descriptors:** \*Diatoms, \*Metabolism, \*Absorption, \*DDT, \*DDE, Path of pollutants, Pesticide residues, Pesticides, Chlorinated hydrocarbon pesticides, Chromatography, Cultures, Radioactivity techniques, Biodegradation.

**Identifiers:** Biotransformation, Thin layer chromatography, Bioaccumulation, Chlorinated hydrocarbons, *Nitzschia*, Culture media, Metabolites, C-14, Recovery, Biological samples.

Ten diatom cultures were isolated from a sample of ditch water by adding 5 ml of sample to Warner's agar. After incubation and additional culturing, pure cultures were exposed for 2 weeks to 0.71 ppm C-14 labeled DDT dissolved in benzene. After the 2-week period glacial acetic acid was added to the flasks and the mixture immediately extracted 3 times. The medium was then filtered and the cells were extracted 3 times with acetone. Thin-layer chromatography was used to separate DDT from metabolites. On the basis of these tests, *Nitzschia* sp. and an unidentified diatom were selected for further studies. The procedure was repeated in 4 replicates of each culture and a control without diatom inoculation. The results showed DDE to be the only metabolite produced by either culture. The unidentified diatom culture degraded more DDT to DDE than the *Nitzschia* species but most of the DDT added to the media remained unchanged in both cultures. The fact that the total radioactivity recovered from the diatom culture media was less than from the control suggests that some of the DDT or its metabolite(s) were bound intracellularly, or were otherwise not extractable by the solvent system used. Evaporation of DDT from the chromatogram may also account for some loss of radioactivity. The results suggest that some species of freshwater diatoms may be significant in the degradation of DDT to the non-insecticidal metabolite, DDE in nature. (Little-Battelle)  
W73-08036

**RAPID BIODEGRADATION OF NTA BY A NOVEL BACTERIAL MUTANT,**

Department of the Environment, Burlington (Ontario). Centre for Inland Waters.

P. T. S. Wong, D. Liu, and B. J. Dutka.  
Water Research, Vol 6, No 12, p 1577-1584, December 1972. 3 fig, 3 tab, 8 ref.

**Descriptors:** \*Nitrilotriacetic acid, \*Isolation, \*Microbial degradation, \*Sewage bacteria, Hydrogen ion concentration, Temperature, Environmental effects, Growth rates, Organic acids, Biodegradation, Spectrophotometry, Ultraviolet radiation, Microorganisms.

**Identifiers:** \*Mutants, \*Substrate utilization, NTA-metal complexes, Iminodiacetic acid, Glycine, Degradation rates, Acclimation, Mutagenization.

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5B—Sources of Pollution

A bacterial mutant was isolated from sewage after ultraviolet mutagenesis and penicillin selection during a study which was initiated to explore the possibility of isolating a potent bacterium which could degrade NTA rapidly. Bacterial flora from sewage after u.v. mutagenesis and penicillin selection were plated onto NTA-agar plates. Colonies which developed after 5 days incubation at 20 degrees C, were picked off and purified by repeated transfers onto fresh agar medium. One culture of Gram-negative short rod bacteria was found to grow most rapidly in 0.5 percent NTA broth. The following conclusions were reached concerning the mutant bacterium: (1) This mutant was able to grow without acclimation in NTA concentrations as high as 2.5 percent as sole carbon, nitrogen and energy source. (2) The mutant could degrade NTA at a wide range of temperatures from 4 degrees to 37 degrees C with the optimal temperature at 20 degrees C. (3) The optimal pH of NTA degradation was pH 7. (4) The mutant could grow on NTA as well as its intermediate products (glycine, iminodiacetic acid). (5) The bacteria were capable of utilizing NTA present in lake water and sewage. (6) The rate of NTA degradation was very rapid. Almost all the NTA was degraded after 4 days incubation at an initial concentration of 0.2 percent NTA. (7) The NTA-metal complexes had no obvious effect on the bacterial degradation of NTA. (Holman-Battelle) W73-08046

**ORGANOCHLORINE PESTICIDE RESIDUES IN WATER, SEDIMENT, ALGAE, AND FISH, HAWAII - 1970-71,**  
Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.  
For primary bibliographic entry see Field 05A.  
W73-08047

**ORGANOCHLORINE PESTICIDE RESIDUES IN COMMERCIALLY CAUGHT FISH IN CANADA - 1970,**  
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.  
For primary bibliographic entry see Field 05A.  
W73-08048

**CHEMICAL RESIDUES IN LAKE ERIE FISH - 1970-71,**  
Food and Drug Administration, Cincinnati, Ohio.  
For primary bibliographic entry see Field 05A.  
W73-08049

**PROCEEDING 1971 TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.**  
Oregon State Univ., Corvallis.

Available from the National Technical Information Service as COM-71-01115, \$6.00 in paper copy, \$1.45 in microfiche. OSU Sea Grant Circular No 42, 1971. Nath, J.N.; Slotta, L.S. (editors) 343 p, 104 fig, 11 tab, 119 ref.

Descriptors: \*Estuaries, \*Water quality, \*Model studies, Water pollution sources, Water management (Administrative), Water resources development, Conference, Bays, Estuarine environment, Estuarine fisheries, Aquatic environment, Mathematical models, Numerical analysis, Physical models, Hydrological models, Benthos, Data collections.

Identifiers: \*Pacific Northwest, Hydro-ecology, Infrared imagery, Bellingham Harbor, Umpqua estuary, Grays Harbor, Tillamook estuary, San Diego Bay, San Francisco Bay, Tidal currents, New York Bay, Dredging, Dye dispersion, Saline intrusion, Schrewsbury River, Navesink River, Waste loadings, Yaquina River, Coos Bay, Stommel's model, Salinity profile, Upwelling, Thomann's Model, Oxygen deficiency, Flushing rate, Tidal Prism Models.

The theme of the 1971 Technical Conference on Estuaries of the Pacific Northwest was management and planning for water quality in the Pacific Northwest estuaries. Some of the topics presented included theme-related model studies: 'The Potential of Physical Models to Investigate Estuarine Water Quality Problems', 'Applications of Some Numerical Models to Pacific Northwest Estuaries', and 'Mathematical Modeling of Estuarine Benthic Systems'. Other papers dealt with data acquisition techniques or results of experimentation done on waste disposal in the estuaries. Included among these were: 'Remote Sensing Acquisition of Tracer Dye and Infrared Imagery Information and Interpretation for Industrial Discharge Management', 'Studies of Sediment Transport in the Columbia River', and 'A Study of Sediments from Bellingham Harbor as Related to Marine Disposal'. Topics concerned with some of the ecological, legal, and historical aspects of the estuaries and their management include: 'Legal Protection of the Pacific Northwest Estuaries', 'Hydro-Ecological Problems of Marinas on Puget Sound', 'Historical Changes in Estuarine Topography with Questions on Future Management Policies', 'Effects of Institutional Constraints and Resources Planning on Growth in and Near Estuaries', and 'Recent Federal Policies Affecting Marine Science and Engineering Developments'. (MacKan-Battelle) W73-08051

#### POLLUTION OF SUBSURFACE WATER BY SANITARY LANDFILLS, VOLUME I,

Drexel Univ., Philadelphia, Pa.

A. A. Fungaroli.

Available from Sup Doc, GPO, Washington, D.C. 20402, Price \$1.50. Environmental Protection Agency Interim report SW-12 rg, 1971. 186 p, 61 fig, 11 tab, 15 ref, 5 append. EPA Grant 000162.

Descriptors: \*Landfills, \*Garbage dumps, \*Model studies, \*Leachate, Laboratory tests, On-site tests, Water pollution sources, Path of pollutants, Computer programs, Mathematical models, Lysimeters.

The behavior of sanitary landfills in southeastern Pennsylvania and a large portion of the region between Washington, D.C., and Boston was studied using a lysimeter and a field test. The laboratory facility was operated under controlled conditions, while the field facility was operated under natural conditions. The lysimeter functioned as a closed system representative of the center of a large sanitary landfill, the depth of which was small in comparison to its areal extent. Temperatures, gases, and leachate quality were collected on a routine basis. The laboratory landfill behavior pattern is representative of young low-compaction density refuse. Within ten days of its initiation, refuse temperatures reached 150 deg F at the center, and stabilized at approximately 80 deg F after 60 days. The refuse was initially in the aerobic state, and after 60 days an anaerobic condition became dominant. The lysimeter began to produce leachate almost immediately, even though the refuse had a very low moisture content. At field capacity, net infiltration and leachate quantities were approximately equal. A computer program is given for model studies. First appearance of leachate is dependent on site conditions, including surface grading, vegetation, and soil. The early leachate is highly polluted, acidic pH of 5.5, and carries many dissolved and suspended solids. (See also W72-06103) (Knapp-USGS) W73-08073

**PREDICTED EFFECTS OF PROPOSED NAVIGATION IMPROVEMENTS ON RESIDENCE TIME AND DISSOLVED OXYGEN OF THE SALT WEDGE IN THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,**  
Geological Survey, Tacoma, Wash.  
W. L. Haushild, and J. D. Stoner.

Geological Survey open-file report, 1973. 13 p, 5 fig, 2 ref.

Descriptors: \*Saline water intrusion, \*Estuaries, \*Washington, \*Dissolved oxygen, \*Channel improvement, Navigation, Water circulation, Path of pollutants, Dredging, Stratified flow, Saline water-freshwater interfaces, Mathematical models, Simulation analysis.

Identifiers: \*Duwamish River (Wash).

A model of the circulation and quality of water in the Duwamish River estuary predicts the effects of a proposed widening and deepening of waterways on residence time and dissolved oxygen in the estuary's salt wedge. For a low river discharge period in August 1970, use of the model yielded an estimated residence time of wedge water to be 6.3 days in the present waterways estuary and 8.6 days in the wider and deeper proposed waterways estuary. For June to September 1970 and for the estuary about 4 miles upstream from its mouth, dissolved-oxygen values in the wedge of the proposed waterways estuary would be as much as 1.4 milligrams per liter lower and would average 0.4 milligrams per liter lower than the present values. Extrapolation to low dissolved-oxygen values suggests that 4 miles upstream of the estuary mouth oxygen would be completely depleted from the proposed waterways estuary wedge whereas there still would be 0.2 milligram of oxygen per liter of water in the present estuary. (Knapp-USGS) W73-08084

**PH AND SOLUBLE CU, NI AND ZN IN EASTERN KENTUCKY COAL MINE SPOIL MATERIALS,**  
Kentucky Univ., Lexington. Dept. of Agronomy. H. F. Massey.  
Soil Science, Vol 114, No 3, p 217-221, September 1972. 1 fig, 2 tab, 18 ref.

Descriptors: \*Leaching, \*Mine wastes, \*Hydrogen ion concentration, \*Water pollution control, \*Path of pollutants, Trace elements, Heavy metals, Zinc, Copper, Nickel, Acid mine water, Coal mine wastes, Manganese, Water pollution sources, Mine acids, Coal mines.

The concentrations of Fe, Al and Mn in the leachate of spoil bank materials are found to be related to the pH of the leachate. Liming of spoil materials should reduce the concentrations of these ions in solution, but the multiplicity of factors involved prevents direct calculation of the pH effect. The effects of liming on solution concentrations of Zn, Cu and Ni can be roughly estimated from pH measurements on the basis of studies with 4 spoil materials. More accurate estimates could be obtained by making a few determinations on each spoil material. Of the 3 elements studied, Ni appeared to be most likely to remain in the soil solution in toxic amounts once the pH has been adjusted to a point which would otherwise be satisfactory for plant growth. (Knapp-USGS) W73-08088

**HUMAN WASTE POLLUTION IN UNITED STATES FORESTS.**  
Environmental Protection Center, Inc., Inglewood, Calif.

Project Report 721, August 27, 1972. 21 p, 4 fig, 1 tab, 9 ref, 3 append.

Descriptors: \*Water pollution sources, \*Recreation wastes, \*Sewage, \*Camping, \*Waste disposal, Environmental effects, Groundwater, Leaching, Cesspools, Water pollution control, Reviews, Evaluation.

Population pressure and the increased use of United States Forests for recreation coupled with archaic methods of managing human waste in those environments have led to widespread deteri-

oration of water resources and increased exposure to disease. This report quantifies this problem and is offered to educate and inform those who are interested in arresting the general degradation of our environment. In 1970 a record 172,554,500 visitor days were recorded in the 187,000,000 acres of forests managed by the Forest Service. In that same year the Service operated 66,024 toilets to accommodate these visitors. Of these facilities 41,862 or better than 63% were primitive pit and vault privy toilets. The privy and vault toilet are the greatest source of human excrement contamination in the pristine forest. In many areas these toilets are located near water supplies and streams, continually leaching their contents into the environment. Action should be taken to remedy this situation. As an immediate first step, adequate sanitation systems should be set up in all areas where pollution is known to be taking place. Then, long-range plans should be made. (Woodard-USGS)

W73-08134

**URBAN HYDROLOGY—A SELECTED BIBLIOGRAPHY WITH ABSTRACTS,**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 04C.

W73-08164

**WATER QUALITY ASPECTS OF THE STATE OF WASHINGTON, PART B,**  
Washington State Univ., Pullman.  
For primary bibliographic entry see Field 05D.

W73-08178

**TOXICITY OF CHEMICALS IN PAPER FACTORY EFFLUENTS,**  
Danmarks Fiskeri- og Havundersogelser, Charlottenlund (Denmark).  
For primary bibliographic entry see Field 05C.

W73-08235

**UTILIZING METAL CONCENTRATION RELATIONSHIPS IN THE EASTERN OYSTER (CRASSOSTREA VIRGINICA) TO DETECT HEAVY METAL POLLUTION,**  
Virginia Inst. of Marine Science, Gloucester Point.  
For primary bibliographic entry see Field 05A.

W73-08237

**A PROPOSAL FOR THE APPLICATION OF MONOD'S MATHEMATICAL MODEL TO THE BIODEGRADATION OF MINERAL OIL IN NATURAL WATERS,**  
Politecnico di Torino (Italy). Instituto di Chimica Industriale.  
U. Fasoli, and W. Numann.  
Water Research. Vol 7, No 3, p 409-418, March 1973. 4 fig, 11 ref.

**Descriptors:** \*Biodegradation, \*Evaporation, \*Forecasting, Water pollution, Mathematical models, Microbial degradation, Oxygen, Anaerobic conditions, Oily water, Solvent extractions, Water pollution control.  
**Identifiers:** \*Monod's model, \*Mineral oil, \*Hydrocarbons, Aghajari oil, Sample preparation, Infrared analysis, Substrate utilization.

This study was designed to obtain a set of results that would serve as a means of: (1) investigating the possibility of employing the formula of Monod's model in the interpretation of mineral oil biodegradation; (2) evaluating the coefficients or constants used in the formula in terms of their influence on the course of biodegradation; and (3) determining the part played by evaporation and re-oxygenation in the overall process of oil removal by comparison with the biological process, and the effect of the possible onset of anaerobic phenomena. Oil emulsions were prepared using Aghajari oil and two series of experiments were

run in half-filled and in completely filled bottles. The oily water was extracted with CC14, and infrared analyses and the (1958) API 733 method were used to determine hydrocarbon content; oxygen determination was made using the Winkler method; and bacterial counts were made after filtration on a Sartorius 14005 membrane containing a nutritive substrate. It can be concluded from the results that 2 mechanisms are primarily involved in forecasting natural hydrocarbon pollution phenomena: evaporation and biodegradation. Evaporation is very important in perfectly still water and may be a primary factor when mixing takes place. Biodegradation is always involved in the natural elimination of mineral oil. Monod's model gives a good approximation for the forecasting of its course, provided it is recognized that certain oil components, which are in fact oxidized much more slowly, must be treated as non-biodegradable. It seems safe to assert that anaerobic conditions will arise when initial hydrocarbons levels are around 20 ppm, except in cases where the water is already markedly oxygen-deficient and all forms of aeration are excluded. (Holoman-Battelle)

W73-08238

**CELL REPLICATION AND BIOMASS IN THE ACTIVATED SLUDGE PROCESS,**  
Illinois Univ., Urbana. Dept. of Sanitary Engineering.  
R. E. Speece, R. S. Engelbrecht, and D. R. Aukamp.  
Water Research, Vol 7, No 3, p 361-374, March 1973. 11 fig, 6 tab, 8 ref.

**Descriptors:** \*Activated sludge, \*Biomass, \*Microorganisms, Suspended solids, Growth kinetics, Methodology, Organic loading, Organic matter, Sewage bacteria, Bioindicators, Waste water treatment.

**Identifiers:** \*Substrate utilization, \*Cell replication, Deoxyribonucleic acid, Substrates, Optical density, Nucleic acids.

Because of the inherent difficulty in enumerating cell numbers in a flocculent suspension, deoxyribonucleic acid (DNA) was chosen as an indicator of cell numbers in the activated sludge process. A direct relationship between the concentration of DNA in the sludge and plate count was found with a dispersed growth of mixed culture microorganisms. Therefore, it was assumed that a direct relationship existed between cell numbers and DNA concentration in the sludge in a flocculent suspension of mixed culture microorganisms as found in activated sludge. An increase in DNA was therefore assumed to be an indication of cell replication. An increase in biomass before an increase in DNA indicated a storage of substrate in some form and not replication of organisms. The average increase in the weight per cell was determined by dividing the weight of biomass just prior to an increase in DNA by the initial weight of organisms present. Storage was a function of the loading rate to which the organisms were acclimated. A sludge acclimated to a loading rate of 2.0 per day increased 270 percent in biomass before replication. Sludges acclimated to lower loading rates showed an extended time lag before cell replication occurred, while higher loading rates maintained the sludges in a more active state having shorter time lags before replication occurred. Increased frequency of feeding also resulted in less time before replication occurred. Replication commenced as long as 4 h after the external substrate was exhausted and the maximum biomass was reached in the F/M equal 0.4 system. Thus, in the contact stabilization process, cell replication would be expected in the stabilization tank with only substrate storage taking place in the contact tank, due to low loading rates used. (Holoman-Battelle)

W73-08247

**NITROGEN FIXATION BY A BLUE-GREEN EPIPHYTE ON PELAGIC SARGASSUM,**  
Woods Hole Oceanographic Institution, Mass.  
For primary bibliographic entry see Field 05C.  
W73-08246

**MARINE WASTE DISPOSAL - A COMPREHENSIVE ENVIRONMENTAL APPROACH TO PLANNING,**  
D. P. Norris, L. E. Birke, Jr., R. T. Cockburn, and D. S. Parker.  
Journal Water Pollution Control Federation, Vol 45, No 1, p 52-70, January 1973. 12 fig, 4 tab, 12 ref.

**Descriptors:** \*Bioassay, \*Toxicity, \*Pacific Ocean, Worms, Sticklebacks, \*Sewage, \*Sculpins, Sea basses, Crabs, Shrimp, Snails, Clams, Mussels, \*Estuaries, Dispersion, On-site studies, Plankton, Benthos, Currents (Water), Mixing, Tracers, Water temperature, Salinity, Dissolved oxygen, Instrumentation, Waste disposal, Waste water (Pollution), Dyes, Aquatic drift, Tides, Sediments, Suspended solids, Water pollution sources, Water pollution effects, Outfall sewers, Aerial photography, Chlorides, Population, Sewage disposal.

**Identifiers:** \*Species diversity, Polychaetes, Tubifex, Three-spined stickleback, Cymatogaster aggregata, Hyperprosodon argenteum, Citharichthys sordidus, Ophiodon elongatus, Scorpaena guttata, Sebastodes, Gasterosteus aculeatus, Pagurus samuelis, Hemigrapsus oregonensis, Emerita analoga, Crago, Callianassa californiensis, Tegula funebralis.

The city of San Francisco undertook a comprehensive study of the marine environment (San Francisco Bay and the Pacific Ocean) to determine where and in what quantities it is feasible to dispose of the city's dry- and wet-weather wastewater effluents. The first phase of the study defined oceanographic characteristics of potential discharge sites and the fate of the discharges. This included determination of mass water movement, drift of particulate matter on the water surface, dispersion characteristics, and water characteristics by aerial photography, shipboard instrumentation, in situ equipment, and tracer studies. The second phase of the study was an ecological study which included plankton studies, benthic studies, diving studies of near-shore areas, intertidal studies, in situ bioassays with fish, static and continuous-flow bioassay with fish and macroinvertebrates, microcosm studies, stickleback blood studies, and biostimulation studies. The results of the two phases indicated that marine disposal is feasible and that the marine environment can be adequately protected by discharging chlorinated primary effluent through one or more submarine outfalls with properly designed diffuser systems. The study indicated that additional treatment is not necessary to protect the marine ecosystem. (Little-Battelle)

W73-08247

**EUTROPHICATION AND LOUGH NEAGH,**  
New Univ. of Ulster, Coleraine (Northern Ireland).  
For primary bibliographic entry see Field 05C.  
W73-08252

**ROLE OF PHOSPHORUS IN EUTROPHICATION AND DIFFUSE SOURCE CONTROL,**  
Wisconsin Univ., Madison. Water Chemistry Program.  
For primary bibliographic entry see Field 05C.  
W73-08255

**MIREX AND DDT RESIDUES IN WILDLIFE AND MISCELLANEOUS SAMPLES IN MISSISSIPPI - 1970,**  
Mississippi State Univ., State College. Dept. of Biochemistry.

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5B—Sources of Pollution

For primary bibliographic entry see Field 05A.  
W73-08267

**CAUSES OF MASSIVE INFECTION OF PINK SALMON WITH SAPROLEGNIA IN THE RIVERS OF ITURUP (ETOROFU) ISLAND, (IN RUSSIAN),**  
V. N. Ivankov.  
Uch. Zap Dal'nevost Univ., Vol 15, No 3, p 124-126, 1971.  
Identifiers: Crustaceans, Infection, Islands, \*Iturup (Etorofu) Island (USSR), Massive, \*Pink salmon, Salmon, \*Saprolegnia, USSR.

Infection of pink salmon with Saprolegnia was especially strong in 1963. Saprolegnia grew in areas where parasitic crustaceans were attached. In the rivers most of the fish were free from the parasites except those in infected areas. Some of the fish recovered in marine water.—Copyright 1972, Biological Abstracts, Inc.  
W73-08271

**ROTENONE AND ITS USE IN ERADICATION OF UNDESIRABLE FISH FROM PONDS,**  
Freshwater Fisheries Research Station, Chandpur (Bangladesh).  
K. A. Haque.  
Pak J Sci Ind Res. Vol 14, No 4/5, p 385-387, 1971.  
Identifiers: Crustaceans, Fish, Frogs, \*Ponds, \*Rotenone, Snakes, \*Bangladesh.

Rotenone, its origin and use are described. Results of application of the chemical to 3 ponds of the Fish Seed Multiplication Farm at Jamalpur, Mymensingh, for eradication of undesirable species are given. Rotenone takes time to reach the deep bottom of ponds in absence of any effective agitation of water. Snakes, frogs and crustaceans are not readily affected by this plant derivative as they can escape the action through terrestrial respiration. A list of fishes and other aquatic organisms in order of their susceptibility to rotenone is presented. A concentration of 1 ppm at summer temperature, around 30 deg C in this region, was adequate to kill fishes.—Copyright 1972, Biological Abstracts, Inc.  
W73-08279

**OIL SPILLS CONTROL MANUAL FOR FIRE DEPARTMENTS,**  
Alpine Geophysical Associates, Inc., Norwood, N.J.  
For primary bibliographic entry see Field 05G.  
W73-08288

**THE INFLUENCE OF LOG HANDLING ON WATER QUALITY,**  
Oregon State Univ., Corvallis. Dept. of Civil Engineering.  
F. D. Schaumburg.

Copy available from GPO Sup Doc as EPI.23/2:73-085, \$1.25; microfiche from NTIS as PB-219 824, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-085, February 1973. 105 p., 33 fig., 20 tab, 39 ref., 4 append. EPA Project 12100 EBG.

Descriptors: \*Bark, \*Leachate, Toxicity, Water pollution, Oxygen demand, Biochemical oxygen demand, \*Lumbering, Northwest US, Organic matter, Leaching, \*Water storage.  
Identifiers: Forest industry pollution, Logging wastes, Bark sinkage, Bark deposits, \*Log storage, \*Benthic deposits.

The water storage of logs is widely practiced in the Pacific Northwest. An investigation has been made to determine the effect of this practice on water quality. Soluble organic matter and some inorganics leach from logs floating in water and from logs held in sprinkled land decks. The character and quantity of leachate from Douglas fir, ponderosa pine and hemlock logs have been ex-

amined. Measurements including BOD, COD (1.0-4.2 gm/l2 per week), PBI, solids and toxicity (no kill to 20% TLm 96) have shown that in most situations the contribution of soluble leachates to holding water is not a significant water pollution problem. The most significant problem associated with water storage appears to be the loss of bark from logs during dumping, raft transport and raft storage. Bark losses from 6.2% to 21.7% were measured during logging and raft transport. Dislodged bark can float until it becomes water logged and sinks, forming benthic deposits. Floating bark is aesthetically displeasing and could interfere with other beneficial uses of a lake, stream or estuary. Benthic deposits exert a small, but measurable oxygen demand and may influence the biology of the benthic zone. Implementation of corrective measures by the timber industry to reduce bark losses could make the water storage of logs a practice which is compatible with a high quality environment. (EPA)  
W73-08294

**MIGRATION AND METABOLISM IN A TEMPERATE STREAM ECOSYSTEM,**  
North Carolina Univ., Chapel Hill. Dept. of Zoology.

A. S. Hall.  
Ecology, Vol 53, No 4, p 585-604, Summer 1972. 9 fig., 3 tab, 99 ref. OWRR B-007-NC (5).

Descriptors: Ecological distribution, \*Energy budget, \*Respiration, \*Fish migration, Fish behavior, Metabolism, \*Cycling nutrients, \*Phosphorus, \*North Carolina, Water pollution sources, Water pollution effects.

Identifiers: \*New Hope Creek (NC), Morgan Creek (NC), Orange County (NC), Durham County (NC), \*Cape Fear River (NC).

Fish migration, total stream metabolism, and phosphorus were studied in New Hope Creek, N.C., from April 1968 to June 1970. Upstream and downstream movement of fish was monitored using weirs with traps. Most of the 27 species had a consistent pattern of larger fish moving upstream and smaller fish moving downstream. Diurnal oxygen series were run to measure the metabolism of the aquatic community. Gross photosynthesis ranged from 0.21 to almost 9 g O2 m-2 day-1, and community respiration from 0.4 to 13 g O2 m-2 day-1 (mean of 290 and 479 g O2 m-2 yr-1). Both were highest in the spring. Production per volume and respiration per volume were always much larger near the headwaters than farther downstream, apparently due to the dilution effect of the deeper water downstream. Migration may maintain young fish in areas of high productivity. Other effects of migration may include: prey control, recolonization of defaunated regions, genetic exchange, and mineral distribution. An energy diagram was drawn comparing energies of isolation, leaf inputs, currents, total community respiration, fish populations, and migrations. About 1% of the total respiration of the stream was from fish populations, and over 1 year about 0.04% of the total energy used by the ecosystem was used for the process of migration. Each Calorie invested by a fish population in migration returns at least 3 Calories. Analysis of phosphorus entering and leaving the watershed indicated that flows were small relative to storages and that this generally undisturbed ecosystem is in approximate phosphorus balance. Upstream migrating fish were important in maintaining phosphorus reserves in the headwaters. (McJunkin-North Carolina)  
W73-08303

**INFECTION BY ICHTHYOPHTHIRIUS MULTIFILIS OF FISH IN UGANDA,**  
Makerere Univ., Kampala (Uganda). Dept. of Zoology.  
For primary bibliographic entry see Field 05C.  
W73-08330

**ON THE ECOLOGY OF AN ADULT DIGENETIC TREMATODE PROCTOECES SUBTENUIS FROM A LAMELLIBRANCH HOST SCROBICULARIA PLANA,**  
For primary bibliographic entry see Field 05C.  
W73-08331

**THE EFFECT OF SODIUM ALKYL BENZENE-SULPHONATE ON THE DRAINAGE OF WATER THROUGH SAND,**  
Westfield Coll., London (England). Dept. of Zoology.  
For primary bibliographic entry see Field 02K.  
W73-08342

**TIME-OF-TRAVEL STUDY, BATTEN KILL FROM 0.6 MILE EAST OF VERMONT-NEW YORK BORDER TO CLARKS MILLS, NEW YORK,**  
Geological Survey, Albany, N.Y.  
H. L. Shindel.

New York Department of Environmental Conservation Report of Investigation RI-12, 1973. 18 p., 14 fig., 4 tab, 7 ref.

Descriptors: \*Travel time, \*Time lag, \*Streamflow, \*New York, \*Path of pollutants, Dye releases, Tracers, Fluorescent dye, Dispersion.  
Identifiers: \*Batten Kill (NY).

Time of travel was determined for the 30.8-mile reach of Batten Kill between BM 543 bridge, 0.6 mile east of the New York-Vermont border, and Clarks Mills, New York, using Rhodamine B and Rhodamine WT dyes. Cumulative peak time of travel for the peak concentration flow of about 46% duration was 47 hours and for a flow of approximately 89% duration was 101 hours. Relationships between peak, centroid, leading, and trailing-edge times of travel and discharge through the subreaches are shown graphically. Time-of-travel data for each subreach as well as cumulative time graphs for the entire reach for different discharges are given. Dye dispersion and peak-analysis information are also given. (Knapp-USGS)  
W73-08368

**AN INVENTORY AND SENSITIVITY ANALYSIS OF DATA REQUIREMENTS FOR AN OXYGEN MANAGEMENT MODEL OF THE CARSON RIVER,**  
Nevada Univ., Reno. Dept. of Civil Engineering.  
R. G. Orcutt, and J. G. Gonzales.

Cooperative Report Series Publication No EN-1, Civil Engineering Department, College of Engineering, University of Nevada Reno, and Engineering Report No 47 in cooperation with the Center for Water Resources Research, Desert Research Institute, Reno, September, 1972. 53 p., 18 fig., 3 tab, 36 ref., 4 append.

Descriptors: Water resources development, Water quality, Management, Rivers, Wastes, \*Oxygen, \*Simulation analysis, \*Low flow augmentation, \*Dissolved oxygen, \*Waste assimilative capacity, Streamflow, Waste dilution, Computer programs, Benthos, Sewage, Organic matter, Water pollution control, Mathematical models, Systems analysis, \*Nevada.  
Identifiers: \*Carson River Basin (Nev.), \*Sensitivity analysis, Residual waste loads, Data requirements.

The rapid expansion of population in Nevada has compounded the problem of increased waste discharge. Extensive water use has resulted in a decrease in streamflows, causing an increase in the ratio of wastes to dilution water and reducing the assimilative capacity of streams. It is important to know the assimilative characteristics of a river so that a rational plan for wastewater reclamation and utilization can be developed. Using simulation and sensitivity analysis, an assessment has been made of the need for developing more

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Effects of Pollution—Group 5C

specific data on the capacity of the Carson River to assimilate biodegradable wastes. To provide this assessment, the effects of different degrees of low flow augmentation and residual waste loads on the oxygen levels of the River were estimated. Results indicate that the oxygen levels in the Carson River would appear to be most sensitive to dissolved oxygen levels of entering waste water and to the dilution effect of low flow augmentation. Computed oxygen levels are less sensitive to assumed benthic deposits and increased sewage loading and relatively insensitive to the organic concentrations of entering wastes and to reasonable variations of the physical features of the low flow model chosen to simulate the Carson River. (Bell-Cornell) W73-08382

**MODELING LEAD POLLUTION IN A WATERSHED—ECOSYSTEM,** Illinois Univ., Urbana, Dept. of Forestry. G. L. Rolfe, A. Chaker, J. Melin, and B. B. Ewing. Journal of Environmental Systems, Vol 2, No 4, p 339-349, December, 1972. 6 fig, 2 tab, 4 ref.

Descriptors: \*Lead, Pollutants, Ecosystems, \*Watersheds (Basins), \*Stimulation analysis, \*Illinois, Atmosphere, Heavy metals, Streams, Soils, Soil water, Surface waters, Gasoline, Aquatic environment, Terrestrial habitats, Estimating, Data collections, Computer programs, Mathematical models, Systems analysis, \*Path of pollutants. Identifiers: \*Champaign County (Ill.), \*Pollutant transport, Seasonal variation, Spatial distribution.

Currently in progress is an interdisciplinary study in which understanding and modeling the movements and effects of heavy metals in the environment are objectives. A model is presented which simulates the movements and predicts the accumulation points of lead in a 76-square mile watershed—ecosystem in Champaign County, Illinois. Transport processes, seasonal variation, and spatial location are considered. A stochastic variation is utilized in the model to account for variability not related to location or season. The model is continually refined and tested by correlating it with field data from the ecosystem. Lead outputs and movements within the stream portion of the watershed are constantly monitored at five locations within the watershed, allowing comparisons between units of different land use. The model includes components of both aquatic and terrestrial ecosystems and represents the ecosystem by a network of nodes and branches where the nodes represent the ecosystem components in a general sense and the branches indicate possible transport mechanisms between nodes. Results of a two-year simulation using a network of 36 nodes and 121 branches are presented. The model is valuable for the study of pollutant transport and accumulation in ecosystems, and for evaluating various alternatives of lead pollution control. (Bell-Cornell) W73-08384

**STUDIES OF THE MECHANISM OF ACTION OF FUSICOCCIN, THE FUNGAL TOXIN THAT INDUCES WILTING, AND ITS INTERACTION WITH ABScisic ACID,** Lancaster Univ., Bailrigg (England). Dept. of Biological Sciences.

G. R. Squire, and T. A. Mansfield. *Planta* (Berl). Vol 105, No 1, p 71-78, 1972. Illus. Identifiers: \*Abscisic-Acid, Cells, \*Commelinacommis, Fungal toxins, \*Fusicoccin, Hydrolysis, Isotopes, Plasmolysis, Potassium, Starch, Stomatol Toxins, Wilting.

Isolated epidermal strips of *Commelinacommis* were incubated in a medium containing the ions required for stomatal opening. Fusicoccin stimulated opening, accompanied by K entry into the guard cells, and hydrolysis of the starch in their chloroplasts. Abscisic acid alone inhibited K entry and starch hydrolysis, but these effects could be

almost entirely overcome by fusicoccin. Attempts were made to measure the solute potential of the guard cells under the various treatments. Abscisic acid clearly increased their solute potential, but no absolute measurements could be made in the presence of fusicoccin owing to a failure of plasmolysis even with mannitol solutions of solute potential as low as -35 bars. Experiments using isotopically labelled mannitol indicated a massive uptake into the epidermis in the presence of fusicoccin. The effectiveness of this toxin under natural conditions may depend on its ability to counteract effects of abscisic acid, the stress hormone that induces stomatal closure. Copyright 1973, Biological Abstracts, Inc. W73-08408

**PRELIMINARY RESEARCH ON THE PSYCHROPHILIC LIPOLYTIC BACTERIA OF THE SOIL AND WATER, (IN FRENCH),** Ottawa Univ. (Ontario). Dept. of Biology. C. Breuil, and A. M. Gouzot. *Can J Microbiol.* Vol 18, No 9, p 1445-1451. 1972. (English summary).

Identifiers: \*Bacteria, \*Lipolytic populations, \*Pseudomonas, Psychrophilic microorganisms, Soils, Winter.

Different soil extract media and other media were assayed for a comparative evaluation of both total and lipolytic populations of bacteria taken from soil and water samples during winter. By incubating at a low temperature, psychrophilic microorganisms were counted and isolated. Gram-negative bacteria, especially *Pseudomonas* species, were the most numerous. Copyright 1973, Biological Abstracts, Inc. W73-08423

**IDENTIFICATION OF AMAZON RIVER WATER AT BARBARDOS, WEST INDIES, BY SALINITY AND SILICATE MEASUREMENTS,** McGill Univ., Montreal (Quebec). Marine Sciences Centre.

D. M. Steven, and A. L. Brooks. *Mar Biol (Berl)*. Vol 14, No 4, p 345-348. 1972. Illus. Identifiers: Amazon River, \*Barbados (West Indies), Identification, Measurements, Rivers, \*Salinity, \*Silicates, West-Indies.

Salinity and silicate concentrations were studied at about fortnightly intervals for 21 mo. at a station near Barbados, W. Indies; latitude 13 deg 15 min N, longitude 59 deg 42 min W. A sensitive inverse correlation was found to exist at 5 and 25 m, but not at greater depths. Salinity near the surface varied between 33.5 and 36.0%, and silicate between a little less than 1 and 4 micrograms at/l. Low salinity water, rich in silicate, was found from Feb. to July; salinity increased and silicate decreased from Sept. to Dec. It is argued that the low salinity water at Barbados can be identified with the areas of reduced salinity found by Ryther et al. (1967) about latitude 8 deg to 10 deg N, longitude 50 deg to 55 deg W, and that this water originates from the Amazon River. Local precipitation does not seem to be a significant factor. Copyright 1973, Biological Abstracts, Inc. W73-08430

**WATER POLLUTION IN SUEZ BAY,** Red Sea Inst. of Oceanography and Fisheries, Al Ghurdaqah (Egypt).

For primary bibliographic entry see Field 05G. W73-08432

**SALICYLANILIDE I, AN EFFECTIVE NON-PERSISTENT CANDIDATE PISCICIDE,** Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.

For primary bibliographic entry see Field 05C. W73-08434

**DEVELOPMENT OF A NEW ENGLAND SALT MARSH,** For primary bibliographic entry see Field 021. W73-08443

**ECOLOGY OF ARBOVIRUSES IN A MARYLAND FRESHWATER SWAMP: II. BLOOD FEEDING PATTERNS OF POTENTIAL MOSQUITO VECTORS,** Walter Reed Army Inst. of Research, Washington, D.C.

J. W. Leduc, W. Suyemoto, B. F. Eldridge, and E. S. Saugstad. *Am J Epidemiol.* Vol 96, No 2, p 123-128. 1972.

Identifiers: *Aedes-Atlanticus*, *Aedes-Canadensis*, \*Arboviruses, Birds, Blood, *Culex-Salinarius*, *Culex-Melanura*, Ecology, Mammals, \*Maryland, \*Mosquito vectors, *Psorophora-Ferox*, \*Swamps, Vectors, Water pollution effects.

Blood engorged mosquito specimens from the Pocomoke Cypress Swamp, Maryland, were collected from May through Nov., 1969. Five mosquito species (*Aedes atlanticus*, *A. canadensis*, *Culex salinarius*, *Culiseta melanura* and *Psorophora ferox*) were examined by capillary type precipitin tests of engorged material and by comparisons of human biting collections and collections of mosquitoes attracted to caged animals. *A. atlanticus* and *P. ferox* had similar feeding patterns, both most frequently found on sylvatic mammals, while *C. salinarius* appeared to feed mostly on domestic mammals adjacent to the swamp. *A. canadensis* was an omnivorous feeder, while *C. melanura* fed almost exclusively on birds. The potential of these mosquitoes as vectors of arboviruses known to be present in the swamp is discussed. (See also W73-08446) Copyright 1973, Biological Abstracts, Inc. W73-08447

### 5C. Effects of Pollution

**WATER QUALITY CHANGES IN AN IMPOUNDMENT AS A CONSEQUENCE OF ARTIFICIAL DESTRATIFICATION,** North Carolina Univ., Chapel Hill. School of Public Health.

C. M. Weiss, and B. W. Breedlove. Available from the National Technical Information Service as PB-219 390, \$6.75 in paper copy, \$1.45 in microfiche. North Carolina Water Resources Research Institute, Report No. 80, January 1973, 216 p, 108 fig, 28 tab, 22 ref. OWRR B-007-NC (6). 14-01-0001-1933.

Descriptors: \*Water quality control, \*Destratification, \*North Carolina, Impoundments, Reservoir operation, Lakes, Epilimnion, \*Hypolimnion, \*Diptera, Oxygen requirements, Aeration, Distribution patterns, Water temperature. Identifiers: \*University Lake (N.C.).

Destratification of a water supply impoundment was studied over a three year period. Prior to destratification, baseline information on physical, chemical and biological parameters was established. Destratification was accomplished by the use of the 'Air-aqua' system which creates vertical circulation in a body of water by the release of small bubbles from hoses laid on the lake bottom. Effectiveness of destratification distinctly evident in temperature distribution in the epilimnion and hypolimnion. Deep waters of the hypolimnion did not lose oxygen to the point of becoming anaerobic, as they had under stratified conditions. However, quantity of oxygen present showed a limited degree of aeration from the transport of surface water downward, and showed rapid rate of deoxygenation characteristic of the hypolimnion of University Lake. Striking changes in numbers and population characteristics of the phytoplanktonic organisms clearly evident in each of the two years of destratification. Benthic forms, particularly the Chironomidae, shifted from spe-

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5C—Effects of Pollution

cies tolerant of micro-aerobic conditions to those requiring higher levels of oxygen. Total period of observation was too short to establish clear changes in characteristics of fish populations, but it was evident that due to the behavior of fish relative to the air bubbles, the number of fish caught per hour increased. Overall distribution of organic material occurred in the lake as the body of water became more homogeneous. During the summer months, this resulted in an increase in chlorine demand at the water treatment plant which uses University Lake as a water supply. W73-07818

**LAKES OF BELORUSSIA (BELORUSSKOE POOZER'YE),**  
Belorussian State Univ., Minsk (USSR). Laboratoria Ozerovedeniya.  
For primary bibliographic entry see Field 02H.  
W73-07907

**RESULTS FROM MULTI-TRACE-ELEMENT NEUTRON ACTIVATION ANALYSES OF MARINE BIOLOGICAL SPECIMENS,**  
California Univ., Irvine. Dept. of Chemistry.  
V. P. Guinn, and R. Kishore.  
Available from NTIS, Springfield, Va., as CONF-721010-10; \$3.00 paper copy, \$1.45 microfiche. Report CONF-721010-10, Oct 1972. 5 p, 6 ref.

Descriptors: \*Marine biology, \*Trace elements, \*Neutron activation analysis, \*Analytical techniques, Gamma rays, Spectroscopy, Mercury, Zinc, Marine animals, Mammals, Marine fish, Kelps, Pacific Ocean, Public health, Food chains, Fish physiology, Animal physiology.  
Identifiers: Selenium.

In Pacific Ocean Marine mammals and large fish, much higher levels of Se and Zn were found in liver than in muscle tissue. With the mammals the same was the case for Hg; however, with the fish the level of Hg was about the same in both liver and muscle tissue. There was appreciable variation between different specimens of the same species and size, and even within a given tissue of a single specimen - such that it is important that large numbers of samples are analyzed. Levels as low as 0.01 ppm Hg, 0.02 ppm Se, and 0.2 ppm Zn could be detected using Ge (Li) gamma spectrometry. (Bopp-ORNL)  
W73-07927

**NUCLEAR POWER,**  
Princeton Univ., N. J. Center of International Studies.  
G. Garvey.  
In: Energy, Ecology, Economy, by Gerald Garvey, W. W. Norton and Company, Inc., New York. 1972. p 135-155. 2 fig, 1 tab, 11 ref.

Descriptors: \*Nuclear powerplants, \*Radioactivity effects, \*Water pollution effects, \*Food chains, Feasibility studies, Cost analysis, Hazards, Safety, Waste disposal, Nuclear wastes, Public health, Toxicity, Economic prediction, Future planning (Projected), Risks, Evaluation, Path of pollutants, Insurance, Costs, Compensation.

Nuclear-power hazards are reviewed including those from mining and processing U, and from concentration of fission products in food chains. Using the conservative linear extrapolation of effects (increased susceptibility to disease and genetic effects) to a low-dose level, the cost in medical care per person per year in the 1980's will be about \$2.40, with lethal effects resulting in a very small minority of cases. It is considered that although insurance cannot be obtained for all future contingencies, the cost for insurance against the trivially small hazard of disastrous accidents should be relatively small. (Bopp-ORNL)  
W73-07928

#### THE ECOLOGY OF THE PLANKTON OF THE CHESAPEAKE BAY ESTUARY, PROGRESS REPORT DEC 1970-AUG 1972,

Johns Hopkins Univ., Baltimore, Md.  
W. R. Taylor, V. Grant, J. J. McCarthy, G. MacKiernan, and S. S. Storms.

Available from NTIS, Springfield, Va., as COO-3279-3; \$3.00 in paper copy, \$1.45 in microfiche. Report COO-3279-3, August 1972. 95 p, 12 fig, 7 tab, 82 ref. AEC-AT (11-1)-3279.

Descriptors: \*Primary productivity, \*Estuarine environment, \*Water pollution effects, \*Copepods, Organic matter, Carbon, Silts, Reviews, Nutrient removal, Photosynthesis, Light, Temperature, Sampling, Seasonal, Vertical migration, Ecological distribution, Dominant organisms, Limiting factors, Environmental effects, \*Chesapeake Bay, Phytoplankton, Zooplankton, Nutrient requirements, Marine algae.

The present hypothesis is that primary productivity is controlled by light and temperature, and that nutrient concentration is not limiting during most of the year. The upper Chesapeake Bay is influenced by the Susquehanna-River silt load. The midbay showed a midsummer peak. The lower bay showed spring and late summer peaks. Dissolved organic carbon was calculated from oxidations at 150 and 950 degrees centigrade. Samples of two copepods were collected over the entire bay, and concurrently, environmental parameters were measured. Also the distribution and some aspects of the behavior responses were studied of a cladoceran which is of ecological importance. Feeding and assimilation rates of the two copepods are being correlated with environmental parameters. (Bopp-ORNL)  
W73-07932

#### STUDIES ON THE RADIOACTIVE CONTAMINATION OF THE SEA, ANNUAL REPORT, 1971,

Comitato Nazionale per l'Energia Nucleare, La Spezia (Italy). Laboratorio per lo Studio della Contaminazione Radioattiva de Mare.

For primary bibliographic entry see Field 05B.  
W73-07942

**APPLIED AQUATIC STUDIES,**  
Oak Ridge National Lab., Tenn.  
For primary bibliographic entry see Field 05B.  
W73-07948

**APPENDIX TO QUARTERLY SUMMARY REPORT, SEPT. 1, 1972, THROUGH DEC. 1, 1972. HEALTH AND SAFETY LABORATORY, FALLOUT PROGRAM,**  
New York Operations Office (AEC), N.Y. Health and Safety Lab.  
For primary bibliographic entry see Field 05A.  
W73-07951

**CHALK RIVER NUCLEAR LABORATORIES PROGRESS REPORT APRIL 1 TO JUNE 30, 1972, BIOLOGY AND HEALTH PHYSICS DIVISION, ENVIRONMENTAL RESEARCH BRANCH AND HEALTH PHYSICS BRANCH,**  
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.  
C. A. Mawson, and G. Cowper.

Available from NTIS, Springfield, Va., as AECL-4272; \$3.00 paper copy, \$1.45 microfiche. Report AECL-4272, September 1972. p 33-65. 3 fig.

Descriptors: \*Nuclear wastes, \*Path of pollutants, \*Canada, \*Tritium, Lakes, Lake sediments, Paleoclimatology, Paleohydrology, Glaciers, Water pollution effects, Absorption, Carbon radioisotopes, Tracers, Aquatic insects, Iron, Cobalt, Iodine radioisotopes, Strontium radioisotopes, Strontium, Phosphates, Primary productivity, Monitoring, Radioactivity techniques.

Effluents and natural waters were monitored for radionuclides. A method for determination of low levels of stable cobalt was developed. Studies were initiated on radioactive and stable Sr in lake sediment, on the tritium input to a lake via ground water, and of the role of tritium retention by soil on the evaporation of tritiated water from ecosystems. Uptake of phosphate and ferric ions by aquatic plants occurred through the roots, even in floating species with submerged absorbent leaves. Phosphate enrichment of lake gave no change in carbon production. Toxicity of organic-coolant contaminated lake water was measured by the feeding behavior of water fleas on F32-labelled yeast. Many-century-old hydrological and climatological conditions were studied by analysis of ice cores for O18, D, and T. Monitoring methods were developed for T and I in air. (Bopp-ORNL)  
W73-07955

#### DISPOSAL OF RADIOACTIVE WASTES ARISING IN THE UNITED KINGDOM FROM THE PEACEFUL USES OF ATOMIC ENERGY,

National Radiological Protection Board, Harwell (England).

For primary bibliographic entry see Field 05E.  
W73-07957

#### TERRESTRIAL AND FRESHWATER RADIODECOLOGY, A SELECTED BIBLIOGRAPHY, SUPPLEMENT 8,

Washington State Univ., Pullman. Dept. of Zoology.

A. W. Klement, Jr., and V. Schultz.

Available from NTIS as TID-3910 (Suppl. 8); \$3.00 paper copy, \$1.45 microfiche. Report TID-3910 (Suppl. 8), 1972. 146 p, 1733 ref.

Descriptors: \*Bibliographies, \*Radioecology, \*Terrestrial habitats, \*Fresh water, Brackish water, Radioactivity effects, Radioactivity techniques, Radioisotopes, Tracers, Tracking techniques, Wildlife.

The many sources (see also W72-04452) for the eighth supplement include Vol. 25 of Nuclear Science Abstracts. References are arranged alphabetically by first author, and 24 bibliographies are listed separately. Indexing is omitted since it was not felt it could be accomplished adequately from the titles and brief abstracts which were on hand. (Bopp-ORNL)  
W73-07962

#### DISTRIBUTION OF RADIONUCLIDES IN ORGANISMS OF MARINE FAUNA. APPLICATION OF CRITICAL CONCENTRATION FACTORS,

For primary bibliographic entry see Field 05B.  
W73-07966

#### ACCUMULATION OF RADIONUCLIDES BY ROE AND LARVAE OF BLACK SEA FISH,

For primary bibliographic entry see Field 05B.  
W73-07967

#### EFFECT OF INCORPORATED RADIONUCLIDES ON CHROMOSOME APPARATUS OF OCENA FISH,

For primary bibliographic entry see Field 05B.  
W73-07968

#### EFFECTS OF MERCURY POLLUTION ON HALIBUT AND THE ALASKAN FISHERY.

Hearing—Subcomm. on Oceans and Atmosphere—

Comm. on Commerce, United States Senate, 92d Cong, 1st Sess, October 8, 1971. 49 p.

Descriptors: \*Mercury, \*Water pollution sources, \*Alaska, \*Fish toxins, \*Fish conservation, Fish, Commercial fish, Saline water fish, Fisheries, Public health, Legal aspects, Fish populations, Water pollution effects, Pollutants, Legislation.

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Effects of Pollution—Group 5C

**Identifiers:** \*Congressional hearing, Coastal waters, Mercury pollution, Halibut fishing.

This hearing took testimony on the effects that mercury pollution has had upon the halibut fishing industry and the environment. Included is testimony from witnesses such as the manager of Seward Fisheries, an advisor on international fisheries, office of the Governor, a member of the Alaska State Legislature, and the president of the Halibut Association of North America. The hearing transcript is accompanied by additional articles, letters and statements; included among these is a report claiming the concern over mercury in fish is unwarranted, a letter and resolution from the general manager of the Santa Clara County Flood Control Water District and a record of the conference which preceded the subcommittee hearing. (Smith-Adams-Florida)

W73-07986

**SOME ASPECTS OF THE QUANTITATIVE ECOLOGY OF MERCURY,**  
Swedish Water and Air Pollution Research Lab., Stockholm.

For primary bibliographic entry see Field 05B.

W73-08013

**BIOLOGICAL EFFECTS AND PHYSICAL PROPERTIES IN THE MARINE ENVIRONMENT OF ALIPHATIC CHLORINATED BY-PRODUCTS FROM VINYL CHLORIDE PRODUCTION,**  
Swedish Water and Air Pollution Research Lab., Goteborg.

A. Jernelov, R. Rosenberg, and S. Jensen.

Water Research, Vol 6, No 10, p 1181-1191, October 1972. 7 fig, 4 tab, 12 ref.

**Descriptors:** Physical properties, \*Bioassay, \*Food chains, \*Marine environment, Water pollution effects, \*Animal physiology, \*Cytological studies, Shrimp, Mussels, Absorption, Adsorption, Animal behavior, Invertebrates, Mollusks, Sorption, Marine fish, Organic compounds, Dispersion, Gas chromatography, Crustaceans, Annelids, Animal growth, Reproduction, Hatching.

**Identifiers:** \*Bioaccumulation, Pollutant effects, \*EDC-tar, Biological effects, Excretion, Aliphatic hydrocarbons, Plaice, Cod (fish), Halibut, Barnacles, Starfish, Polychaetes, Leander adspersus, Mytilus edulis, Pleuronectes platessa, Pandanus borealis, Gadus morhua, Liver, Muscle, Animal tissues, Vinyl chloride, North Sea, Norwegian Sea, Macroinvertebrates, Balanus balanoides, Ophelia texanica, Mitosis, Allium cepa, Ophryotrocha labronica.

EDC-tar, a mixture of short-chained aliphatic hydrocarbons formed as a byproduct of vinyl chloride production, has been dumped into the North and Norwegian Seas. A study was conducted to determine the behavior of some components of the EDC-tar in the marine environment. Results are presented for physical properties, biological accumulation from water and food and excretion in fish, as well as some biological effects (e.g. genetic effects and sensitivity of some organisms during different stages of their life cycle). Dumped into the sea, EDC-tar has a tendency to disperse and to adhere to particles. The accumulation in marine animals via EDC-contaminated seawater is rapid and an accumulation factor of 2900 was estimated for shrimp (Leander adspersus) exposed to 0.01 ppm EDC-tar for 48 h. Accumulation via water has been found to be higher than via a food chain. On the other hand, accumulation of the low molecular compounds of the EDC-tar is highest via water, whereas the high molecular compounds show the highest accumulation via a food chain. Accumulation in cod fed with EDC-contaminated shrimp was higher in liver than in muscle. Excretion was rapid when feeding was discontinued. (Holoman-Battelle)

W73-08014

**EFFECT OF INDUSTRIAL WASTES ON OXIDATION POND PERFORMANCE,**  
M. Moshe, N. Beizer, and Y. Kott.

Water Research, Vol 6, No 10, p 1165-1171, October 1972. 1 fig, 4 tab, 12 ref.

**Descriptors:** \*Bioassay, \*Heavy metals, \*Oxidation lagoons, \*Toxicity, \*Industrial wastes, Cadmium, Copper, Nickel, Zinc, Chromium, Aquatic algae, Laboratory tests, Water pollution effects, Inhibition, Growth rates, Cations, Dissolved oxygen, Chlorophyta, Biochemical oxygen demand, Hydrogen ion concentration, Domestic wastes, Sewage, Sewage bacteria, Coliforms.

**Identifiers:** Chlorella sorokiniana, Pollutant effects, Most probable number test, Algal counts.

Cadmium, copper, nickel, zinc, and hexavalent chromium ions were tested in a bench-bioassay experiment for toxicity limits and possible application to experimental oxidation ponds. Domestic sewage was placed into test tubes where predetermined concentrations of metal ions were added together with known initial concentrations of Chlorella sorokiniana. The test tubes were incubated under controlled illumination (1500 lux) at 29 C. Before and after incubation coliform counts (MPN) were carried out according to Standard Methods (1965). Algal counts were performed using a haemocytometer. Experimental ponds of 50-70 l volume were fed with diluted domestic sewage (BOD equal 200 mg/l). Predetermined quantities of metal salts had been previously added to give the desired concentration of metal ions in the inflowing sewage. At the final stage of the study, an aquarium of 80 l capacity was operated as experimental pond. To this pond a mixture of metal ions (Cr, Cd, Cu, Ni, and Zn) was introduced, beginning with 3 mg/l and increasing to 12 mg/l of each ion. Samples taken from the ponds were subjected to the following tests: pH, dissolved oxygen, BOD, MPN, algal count and determination of metal ion concentration. The samples were taken from the influent, effluent and bottom sludge. It was found that the metal ions were toxic, inhibiting Chlorella growth. However, when added at concentrations of 0.5-1.5 mg/l to influent of oxidation ponds, the ponds continued to operate normally. Higher concentrations of 3 and 6 mg/l did not effect adversely pond performance - not even a concentration of 6 mg/l of each ion (a total metal ion concentration of 30 mg/l). A mixture of 60 mg/l metal ions brought about a decrease in algal numbers and caused a sharp drop in dissolved oxygen concentration. It is believed that since high pH causes metal ions to precipitate, oxidation ponds operating normally above pH 8.0 will tolerate metal ions in sewage containing industrial wastes for a long time before sludge accumulation will affect pond performance. (Holoman-Battelle)

**BACTERIAL CHEMORECEPTION: AN IMPORTANT ECOLOGICAL PHENOMENON INHIBITED BY HYDROCARBONS,**  
Harvard Univ., Cambridge, Mass. Lab. of Applied Microbiology.

R. Mitchell, S. Fogel, and I. Chet.  
Water Research, Vol 6, No 10, p 1137-1140, October 1972. 4 tab, 7 ref.

**Descriptors:** \*Marine bacteria, \*Marine algae, Predation, \*Organic compounds, \*Oil pollution, Water pollution effects, \*Microbial degradation, Diatoms, Inhibition, Phenols, Chrysophyta, Biodegradation, Phytoplankton, Enteric bacteria, Carbohydrates, Amino acids, Attractants, Artificial substrates.

**Identifiers:** \*Chemoreception, Substrates, Chemotaxis, Toluene, Crude oil, Skeletonema costatum, Glucose, Ribose, Proline, Serine, Adenine.

Motile marine bacteria have been shown to display chemoreception, with each microorganism exhibiting a highly specific response, and are at-

tracted to a wide range of organic compounds. Chemoreception is also involved in the biodegradation of phytoplankton and enteric bacteria by bacterial predators. Marine bacteria were isolated from seawater samples on seawater nutrient agar. The predators were isolated by enrichment culture on an artificial seawater medium containing the microbial prey as sole C source. Bacterial chemotaxis was detected using this method: A 5-micron capillary tube sealed at one end and containing the test chemical was placed in a suspension of test bacteria placed in seawater on a microscope slide. Bacterial attraction was observed microscopically. Quantitative data were obtained by plating the contents of the capillary tube on seawater nutrient agar. Nutrients, in very low concentrations, were detected very rapidly. Most carbohydrates and amino acids stimulated chemotaxis at concentrations as low as 0.01 microM. The isolated bacterial predators were capable of degrading the diatom, Skeletonema costatum. The addition of specific aromatic hydrocarbons (phenol, toluene, crude oil) to seawater totally inhibited the chemotactic response of all bacteria without immobilization. The ecological implications of this type of sublethal effect on the self-purifying capacity of the sea and on the behavior of marine animals are discussed. (Holoman-Battelle)

W73-08016

**INACTIVATION ASSAYS OF ENTEROVIRUSES AND SALMONELLA IN FRESH AND DIGESTED WASTE WATER SLUDGES BY PASTEURIZATION,**

J. M. Foliguet, and F. Doncoeur.

Water Research, Vol 6, No 11, p 1399-1407, November 1972. 5 fig, 4 tab, 4 ref.

**Descriptors:** \*Sludge treatment, \*Disinfection, Enteric bacteria, Salmonella, Sewage sludge, Sewage bacteria, Cultures, Waste water treatment.

**Identifiers:** \*Poliovirus, \*Coxsackievirus, \*Salmonella paratyphi, \*Pasteurization, Inactivation.

To determine the effectiveness of a pasteurization process for inactivating enteroviruses and Salmonella, three types of fresh sludge, three types of digested sludge, and pure cultures of poliovirus, Coxsackievirus, Salmonella paratyphi B were subjected to the treatment. The pasteurization procedures consisted of homogenization for 30 minutes, heating from 6-15 C to 80 C in less than 10 minutes, and maintenance at 80 C for 10 minutes. After treatment the samples were rapidly cooled to minus 70 C and stored at minus 25 C until use. Culturing procedures are described by which the samples were assayed. The results showed that the treatment provides relatively thorough inactivation of the pathogenic germs, thereby reducing the infection risk of the sludges. The samples cannot, however, be considered to be entirely sterile since they contain sporulated germs. (Little-Battelle)

W73-08017

**BACTERIAL AND ALGAL CHLOROPHYLL IN TWO SALT LAKES IN VICTORIA, AUSTRALIA,**  
For primary bibliographic entry see Field 05A.

W73-08018

**THE EFFECTS OF FLUORIDE ON ESTUARINE ORGANISMS,**  
National Inst. for Water Research, Pretoria (South Africa).

J. Hemens, and R. J. Warwick.

Water Research, Vol 6, No 11, p 1301-1308, November 1972. 2 tab, 6 ref.

**Descriptors:** Bioassay, \*Toxicity, \*Fluorides, Industrial wastes, \*Crabs, \*Mullet, \*Mussels, Algae, Water pollution effects, Shrimp, Grasses, Diatoms.

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5C—Effects of Pollution

Identifiers: \*Eel grass, \*Prawns, Bioaccumulation, South Africa, Mhalatzi River, \*Richards Bay (So Afr), Aluminum smelters, Mugil cephalus, Ambassis saifha, Therapon jarbua, Penaeus monodon, Perna perna, Palaeomon pacificus, Tylopidax blephariskios, Mud crabs, Zostera.

Experiments to determine the possible effects of fluoride discharged in the effluent from an aluminum smelter on the fauna and flora of the receiving estuary in Zululand, South Africa showed no toxic effects on three species of fish (juvenile mullet, Ambassis saifha, and Therapon jarbua) and two species of penaeid prawns (Penaeus indicus and Penaeus monodon) during 96 h exposure at concentrations up to 100 mg F per liter. The brown mussel Perna perna showed evidence of toxic effects after 5 days exposure at a concentration of 7.2 mg F per liter. Long-term (72 days) exposure in recirculated outdoor laboratory estuary models without external food supply and with 2.0 percent salinity and 52 mg F per liter showed physical deterioration and increased mortality in the mullet Mugil cephalus and the crab Tylopidax blephariskios and the reproductive processes of the shrimp Palaeomon pacificus appeared to be adversely affected. Eel grass and algae grown in the models showed no evidence of fluoride accumulation but all the introduced animals accumulated fluoride, the highest concentration of 7743 microns F per g ash being reached in the mullet compared to 148.1 in the control system. It was concluded that fluoride was accumulated mainly from the water and not via the food materials. (Little-Battelle) W73-08019

**PRIMARY PRODUCTIVITY OF A SHALLOW EUTROPHIC WATER DURING AN APHANIZOMENON FLOSAQUE-BLOOM,**  
Rijksfaculteit der Landbouw- en Wetenschappen, Ghent (Belgium).  
J. De Maeseneer.  
Meded Fac Landbouw- en Rijksuniv Gent. Vol 36, No 4, p 1441-1448. 1971. Illus. English summary.  
Identifiers: Aphanizomenon-Flos-Aquae, \*Belgium, Blooms, Eutrophic waters, Gent, \*Primary productivity, Shallow water.

Measurements of the primary productivity were made following the Gran-method in the 'Nationale Watersportbaan Georges Nachez,' a shallow eutrophic water at Gent during an A. flos-aquae water-bloom period in the autumn of 1971. The results obtained show that the gross primary productivity is very high and must approach or surpass the maximum productivity stated by Steemann-Nielsen. A linear relationship on logarithmic (primary production)-linear (depth) paper was obtained in only 1 case. By extrapolation it can be concluded that the primary production in the superficial layer is about 8 mg C/m<sup>2</sup>/day. —Copyright 1972, Biological Abstracts, Inc.  
W73-08020

**THE LOAD OF INFECTIOUS MICRO-ORGANISMS IN THE WASTE WATER OF TWO SOUTH AFRICAN HOSPITALS,**  
National Inst. for Water Research, Pretoria (South Africa).

For primary bibliographic entry see Field 05B.

W73-08024

**GROWTH RATE DETERMINATIONS OF THE MACROPHYTE ULVA IN CONTINUOUS CULTURE,**  
Harvard Univ., Cambridge, Mass. Lab. of Applied Microbiology.

T. D. Waite, L. A. Spielman, and R. Mitchell. Environmental Science and Technology, Vol 6, No 13, p 1096-1100, December 1972. 6 fig, 1 tab, 12 ref.

Descriptors: \*Marine algae, \*Chlorophyta, \*Growth rates, Cultures, Plant growth, Photosynthesis, Biomass.  
Identifiers: \*Growth kinetics, \*Ulva lactuca, Continuous cultures, Macrophytes.

Continuous culture experiments were run with the benthic macrophyte Ulva lactuca. Using oxygen evolution as a monitor of photosynthesis and dry weight determination for biomass synthesis, growth rates and stoichiometric growth constants were evaluated. The data showed that the ratio of oxygen production to algal mass synthesis is relatively independent of nutrient concentration and growth rate, but is affected by light intensity. The data also showed that the amount of oxygen evolved per unit of algal material was almost a factor of 10 higher than is predicted from carbohydrate synthesis. It appears that Ulva is capable of synthesizing compounds with carbon oxidation states of plus 1 or plus 2, thus estimates of biomass synthesis may be in error when the average algal material is assumed to be carbohydrate. (Holoman-Battelle) W73-08028

**INSECTICIDE TOLERANCES OF TWO CRAYFISH POPULATIONS (PROCAMBARUS ACUTUS) IN SOUTH-CENTRAL TEXAS,**  
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.

D. W. Albaugh.  
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 6, p 334-338, December, 1972. 1 tab, 12 ref.

Descriptors: \*Bioassay, \*Crayfish, \*DDT, Resistance, \*Pesticide toxicity, Water pollution effects, Crustaceans, Invertebrates, Insecticides, Chlorinated hydrocarbon pesticides, Organophosphorus pesticides, Phosphothioate pesticides, Aquatic animals, Texas.  
Identifiers: \*Toxaphene, \*Methyl parathion, \*Procambarus acutus, Macroinvertebrates, Decapods, Arthropods.

Five consecutive bioassays were carried out on Procambarus acutus to determine levels of tolerance to DDT, toxaphene, and methyl parathion, and to compare the tolerance of specimens from an area of intensive insecticide use with that of specimens from an area where use was minimal. Equal numbers of male and female specimens were subjected to each insecticide treatment and crayfish from both areas were tested at 3-5 concentrations of each pesticide in each bioassay. The 48-hr LC<sub>50</sub> values for DDT, methyl parathion, and toxaphene were 2.4, 1.4, and 1.5 times greater, respectively, for animals from the area of high use than for those from the area of low insecticide use. For crayfish from the clean area, DDT and methyl parathion had similar toxicity, but the LC<sub>50</sub> for toxaphene was more than 20 times greater. (Holoman-Battelle) W73-08032

**METABOLISM OF DDT BY FRESH WATER DIATOMS,**  
Manitoba Univ., Winnipeg. Dept. of Entomology.  
For primary bibliographic entry see Field 05B.  
W73-08036

**EFFECTS OF OXATHIIN SYSTEMIC FUNGICIDES ON VARIOUS BIOLOGICAL SYSTEMS,**  
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.

D. E. Mathe.  
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 5, p 311-316, November 1972. 3 tab, 18 ref.

Descriptors: \*Toxicity, \*Enteric bacteria, Fungicides, Chlorella, Growth rates, Metabolism, \*Molds, Photosynthesis, Inhibition, Slime.

Identifiers: \*Carboxin, \*Oxycarboxin, Proteus vulgaris, Bacillus cereus, Pseudomonas aeruginosa, Nocardia rubra, Lactobacillus casei, Azotobacter chroococcum, Streptomyces, Sarcina lutea, Mycobacterium phlei.

Several bacteria, a slime mold, and Chlorella pyrenoidosa were exposed to carboxin (5,6-dihydro-2-methyl-1,4-oxathin-3-carboxamide) and its oxidized products to determine their toxic effects. In the presence of .0001 M carboxin, the following bacteria were inhibited in growth from 0-10 percent: Proteus vulgaris, Bacillus cereus, Pseudomonas aeruginosa, Nocardia rubra, Lactobacillus casei, and Azotobacter chroococcum. Streptomyces, Sarcina lutea, and Mycobacterium phlei was inhibited from 10-20 percent. The metabolism of C-14-acetate was somewhat more sensitive to .0001 M carboxin in that the release of C-14O<sub>2</sub> was inhibited by 34 percent in P. vulgaris and 37 percent in S. leutea. The development of sporangia by the slime mold D. discoideum was not affected by .0001 M carboxin, F831, or oxycarboxin. Metabolism of C-14-acetate by Chlorella cells was not inhibited by .0001 M carboxin, F831, or oxycarboxin. However, photosynthesis was inhibited by 52 percent with .0001 M carboxin but not with .0001 M F831 or oxycarboxin. (Little-Battelle) W73-08045

**RAPID BIODEGRADATION OF NTA BY A NOVEL BACTERIAL MUTANT,**  
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.  
For primary bibliographic entry see Field 05B.  
W73-08046

**THE LITTORAL MICROPHYTIC VEGETATION OF LAKE OHRID (IN SERBO-CROATIAN),**  
Hidrobioloski Zavod, Ochrida (Yugoslavia). I. Cado.  
Acta Bot Croat. 30: p 85-94. 1971. Illus. English summary.  
Identifiers: Bangia, Cladophora, Gloeocapsa, \*Lake Ohrid, Littoral, Microcoleus, Microphytic vegetation, Rivularia, Schizothrix, Scytonema, \*Vegetation, Yugoslavia, Zonation.

Under the modified Mediterranean climatic conditions, the predominant calcareous structure of the massifs of the Lake basin and the features of the shore with its numerous karstic, surface and sublacturing sources, a classic littoral zone has been differentiated in Lake Ohrid with its more characteristic facies: residue facies, sandy-shore facies, pebble-stone and stone facies, and rock facies. The most numerous within the lithophytic association are the representatives of the following groups: Cyanophyta, Bacillariophyceae, Chlorophyta, Rhodophyta, Bryophyta, Lichenes and bacteria. Forms of a wide ecological range which can endure frequent thermal excesses, long spells of dry weather and intensive insolation predominate. The lithophytic vegetation in the littoral zone is stratified. Supralittoral, eulittoral and infralittoral zones were distinguished. The supralittoral could be defined as the Gloeocapsa-Scytonema zone, the eulittoral as the Microcoleus-Schizothrix-Rivularia zone on the one hand and as the Bangia-Cladophora zone on the other. The infralittoral is characterized by an increased number of forms and by an increased quotient in relation to Cyanophyta and other groups. —Copyright 1972, Biological Abstracts, Inc.  
W73-08061

**TOXICITY OF CHEMICALS IN PAPER FACTORY EFFLUENTS,**  
Danmarks Fiskeri- og Havundersøgelse, Charlottenlund (Denmark). B. Norup.  
Water Research, Vol 6, No 12, p 1585-1588, December 1972. 2 fig, 20 ref.

**Descriptors:** \*Effluents, \*Pulp and paper industry, Water pollution effects, Industrial wastes, \*Toxicity, Fish, Freshwater fish, Resistance, Bioassay, Laboratory tests, Mercury, Fish physiology.  
**Identifiers:** \*Pentachlorophenol, \*Lebiasina reticulata, Sodium pentachlorophenolate, Guppy, Slimicides, Phenols, Chlorinated hydrocarbons, Sodium pentachlorophenate, Mercury compounds, Median survival time.

Pentachlorophenol (PCP), a common toxic substance discharged from pulp and paper factories, was compared with mercuric compounds, and its effect on fish resistance was investigated at sublethal PCP-levels. Female guppies (Lebiasina reticulata), acclimated for at least 5 days at 24 plus or minus 0.5°C, were placed in aerated glass tanks in groups of 5-10 per mg Na-PCP. The resistance of the guppy to the sodium salt, Na-PCP, has been shown to increase after acclimation to sublethal levels (1 ppm). The mean survival time of the guppy placed in 5 ppm Na-PCP after acclimation changed significantly from 65 min to 104 min. Such resistance may lead to increased tolerance of accumulated PCP in the organism where severe metabolic distortions, delayed sexual maturity and increased mortality may result. The guppy has been shown to have the fastest reaction and the greatest tolerance among fish. It has been demonstrated by this research that PCP is as toxic to fish as the dangerous, previously used slimicides containing mercury, and less efficient as a controllant of slime organisms and that the use of PCP should be restricted in a manner similar to mercuric compounds to ensure the survival of fish life downstream from paper manufacturing processes. (Holoman-Battelle)  
 W73-08239

**TECHNIQUE FOR MEASURING METALLIC SALT EFFECTS UPON THE INDIGENOUS HETEROPTROPHIC MICROFLORA OF A NATURAL WATER,**  
 Simon Fraser Univ. Burnaby (British Columbia).  
 Dept. of Biological Sciences.  
 For primary bibliographic entry see Field 05A.  
 W73-08236

**CHANGES IN THE MICROBIAL POPULATIONS OF A RESERVOIR TREATED WITH THE HERBICIDE PARAOQUAT,**  
 University of Wales Inst. of Science and Tech., Cardiff.  
 J. C. Fry, M. P. Brooker, and P. L. Thomas.  
 Water Research, Vol 7, No 3, p 395-407, March 1973. 7 fig, 2 tab, 33 ref.

**Descriptors:** \*Microbial degradation, \*Paraquat, Aquatic microorganisms, Water pollution effects, \*Pesticide toxicity, \*Viability, \*Resistance, Chemical analysis, Mud, Aquatic algae, Enzymes, Herbicides, Foulweeds, Chlorophyta, Water sampling, Aquatic weed control, Soil analysis, Aquatic soils, Standing crops, Hydrogen ion concentration.  
**Identifiers:** Angiosperms, Amylase, Protease, Cellulase, Chara globularis, Myriophyllum spicatum, Potamogeton pectinatus, Heterotrophic bacteria, Culture media, Organic carbon, Macrophytes, Espan.

A freshwater fishing reservoir was treated with paraquat for the control of weeds and the response of microbial populations studied. Estimates of the standing crop of macrophytes (P. pectinatus, M. spicatum, and C. globularis) were made periodically by determining the organic carbon content. A paraquat formulation (Espan) was sprayed evenly over the reservoir. Water, weed and mud were sampled frequently after each spraying and analyzed. Water samples taken in sterile bottles and mud samples taken from the surface of the mud were used in the microbial determinations. Counts of (1) viable heterotrophic microorganisms, (2) amylase producers, and (3) viable protease and cellulase producers were made on

CPS medium using different method of development. Viable paraquat resistant microorganisms were enumerated with the addition of 50 micrograms/ml paraquat, as Espan, to the complete CPS medium. Submerged angiosperms were completely eradicated by the application of 1.0 mg/l paraquat, but the subsequent growth of the macrophytic alga, Chara sp., was resistant to a second application of the herbicide. Some changes in the microbial populations of the reservoir over the period of study were consistent with the movement of paraquat within the system and others with the death of the plants. Numbers of arbitrarily classified 'paraquat resistant' microorganisms increased in the water and mud immediately after both herbicide applications, and after the first application a reduction in total viable heterotroph counts was observed. Accompanying the death of the angiosperms were increases in the counts of viable heterotrophs and some exoenzyme producers in the mud and water but after the second application of paraquat, when there was no plant death, these micro-organisms showed little response. (Holoman-Battelle)  
 W73-08239

#### NUTRIENT STUDIES IN TEXAS IMPOUNDMENTS,

Union Carbide Corp., Tonawanda, N.Y. Linde Div.

V. H. Huang, J. R. Mase, and E. G. Fruh.  
 Journal Water Pollution Control Federation, Vol 45, No 1, p 105-118, January 1973. 10 fig, 11 tab, 6 ref.

**Descriptors:** \*Limiting factors, \*Nutrients, \*Photosynthesis, \*Bioassay, \*On-site tests, \*Cyanophyta, \*Nitrogen fixation, \*Dominant organisms, \*Chlorophyta, Carbon, Nitrogen, Phosphorus, Iron, Growth rates, \*Texas, Colorado River, Chlorella, Diatoms, Succession, Anabaena.

**Identifiers:** Acetylene reduction, Lake Livingston, Lake Travis, Trinity River, Chlorella pyrenoidosa, Oscillatoria phomidium.

The objective was to determine the limiting nutrients in two distinctly different reservoirs in Texas, Lake Livingston on the Trinity River and Lake Travis on the Colorado River. The former is laden with relatively high organic and inorganic nutrient concentrations; the other has a low nutrient loading. Phytoplankton and water quality samples were collected and returned to the laboratory for nutrient enrichment tests as well as C-14 and nitrogen fixation tests. The latter two tests were also conducted in situ. Enrichment tests were conducted with natural populations and with inoculations of Chlorella pyrenoidosa. Growth rates were determined every 2 days by optical density measurements. C-14 tests were made with scintillation counts of laboratory and in situ samples with and without added nutrients. Nitrogen fixation was determined by the acetylene reduction method. The results showed that in the high-nutrient system, nitrogen was the limiting nutrient in summer; blue-green nitrogen-fixing algae became dominant in the late summer and from laboratory tests seem to be regulated by the available phosphorus. In the low-nutrient system, nitrogen, phosphorus, or iron could limit phytoplankton growth at different times of the year. With phosphorus enrichment of this system, algae with nitrogen-fixing capabilities could develop. (Little-Battelle)  
 W73-08241

#### NITROGEN FIXATION BY A BLUE-GREEN EPIPHYTE ON PELAGIC SARGASSUM,

Woods Hole Oceanographic Institution, Mass.  
 E. J. Carpenter.

Science, Vol 178, No 4066, p 1207-1209, December 15, 1972. 2 tab, 16 ref.

**Descriptors:** \*Nitrogen fixation, \*Nitrogen cycle, Cyanophyta, Sea water.

**Identifiers:** \*Dichothrix fucicola, \*Sargasso Sea, Acetylene reduction, Enrichment.

Nitrogen fixation by Dichothrix fucicola, an epiphyte on pelagic Sargassum, was measured by acetylene reduction in May and June, 1972, in the western Sargasso Sea and the Gulf Stream. This is the first report of nitrogen fixation by a heterocyst-bearing blue-green alga in the open ocean, and also the first observation of nitrogen fixation in the genus Dichothrix. Cellular carbon-nitrogen ratios suggested that the Dichothrix was nitrogen-starved. In dense aggregations of Sargassum, such as rafts or windrows, the enrichment of surface seawater with combined nitrogen from nitrogen fixation may be pronounced. (Little-Battelle)  
 W73-08246

#### LOWER PH LIMIT FOR THE EXISTENCE OF BLUE-GREEN ALGAE: EVOLUTIONARY AND ECOLOGICAL IMPLICATIONS,

Wisconsin Univ., Madison. Dept. of Bacteriology.

T. D. Brock.

Science, Vol 179, No 4072, p 480-483, February 2, 1973. 1 tab, 25 ref.

**Descriptors:** \*Hydrogen ion concentration, \*Cyanophyta, \*Limiting factors, \*Plant growth, Cultures, Lakes, Algal control.

Observations on a wide variety of acidic environments, both natural and man-made, reveal that blue-green algae (Cyanophyta) are completely absent from habitats in which the pH is less than 4 or 5, whereas eukaryotic algae flourish. By using enrichment culture with inocula from habitats of various pH values, the absence of blue-green algae at low pH was confirmed. The ecological implications of the conclusions are clear. Blue-green algal blooms should never occur in acid lakes, and the pollution of lakes and streams with acid mine drainage should eliminate blue-green algae from these waters. Since even in mildly acidic waters (pH 5 to 6) blue-green algae are uncommon, acidification of lakes may control or eliminate blue-green algal blooms. (Little-Battelle)  
 W73-08248

#### BLUE-GREEN ALGAE: WHY THEY BECOME DOMINANT,

Minnesota Univ., Minneapolis. Limnological Research Center.

J. Shapiro.

Science, Vol 179, No 4071, p 382-384, January 26, 1973. 1 fig, 1 tab, 5 ref.

**Descriptors:** \*Chlorophyta, \*Cyanophyta, Limiting factors, \*Carbon dioxide, \*Hydrogen ion concentration, \*Nitrogen, \*Phosphorus, \*Dominant organisms, Bioassay, Nitrates, Phosphates, Competition, Succession, On-site investigations, Lakes, Minnesota.

**Identifiers:** \*Lake Emily (Minn).

Mixed populations of algae were subjected to a variety of treatments including high concentrations of nitrogen plus phosphorus, high concentrations of CO<sub>2</sub> and high or low pH (5-6) to test the hypothesis that blue-green algae become dominant because they are more efficient at obtaining CO<sub>2</sub> from low concentrations than green algae. The algae were put in plastic bags suspended from a raft in Lake Emily, Minnesota. Although initially the populations consisted of blue-green algae, samples subjected to CO<sub>2</sub> plus nutrients were dominated by green algae. Somewhat similar results occurred with lowered pH and nutrients. It appears that the addition of free CO<sub>2</sub> or lowering the pH make more CO<sub>2</sub> available to green algae and allow them to become dominant. Since green algae are more desirable than blue-greens, injection of CO<sub>2</sub> in lakes may be a way of controlling blue-greens where nutrient sources cannot be controlled. (Little-Battelle)  
 W73-08249

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5C—Effects of Pollution

**EXPERIENCE WITH ALGAL BLOOMS AND THE REMOVAL OF PHOSPHORUS FROM SEWAGE,**  
M. A. Simmonds.  
Water Research, Vol 7, Nos 1/2, p 255-264, January/February 1973. 6 tab, 3 ref.

**Descriptors:** \*Algae, \*Hydrogen ion concentration, \*Alkalinity, \*Carbon dioxide, Limiting factors, Growth rates, Waste water treatment, Absorption, Nutrients, Phosphorus, Phosphates, \*Australia.  
**Identifiers:** \*Phosphorus removal.

Based upon observations of algal blooms in water treatment plants during the period 1930-1940 when phosphate occurred primarily from natural sources, the conclusion is made that the mechanism which triggers algal blooms may be neither nutrient concentration nor the concentration of organic matter. Instead the pH, alkalinity, carbon dioxide equilibrium condition is a major factor, not only in promoting, but also in maintaining algal blooms. The mechanism involved is the conversion of bicarbonates to carbonates at high pH and the consequent release of carbon dioxide which is utilized by algae. Use of algae for removing phosphates from sewage sludge is discussed. Algae were capable of removing large amounts of phosphate, but were themselves difficult to remove from the sewage. (Little-Battelle)  
W73-08251

**EUTROPHICATION AND LOUGH NEAGH,**  
New Univ. of Ulster, Coleraine (Northern Ireland).  
R. B. Wood, and C. E. Gibson.  
Water Research, Vol 7, Nos 1/2, p 173-187, January/February 1973. 5 fig, 5 tab, 27 ref.

**Descriptors:** \*Eutrophication, Water quality, \*Phosphorus, \*Limiting factors, \*Diatoms, Primary productivity, Industrial wastes, Municipal wastes, Cyanophyta, Lakes, Nitrates, Phosphates, Nitrogen, Nutrients, Chlorophyll, Phytoplankton, Zooplankton, Algae, Midges, Invertebrates, Chrysophyta, Isopods.  
**Identifiers:** \*Lough Neagh, Chlorophyll a, Macroinvertebrates, \*Ireland, Oscillatoriidae, Cyclops spp., Diaptomus spp., Diaptomus, Aesalus, Glyptotendipes paripes, Glyptotendipes, Chironomus anthracinus, Procladius spp., Mysis relicta, Cyclotella comensis, Cyclotella ocellata, Tabellaria flocculosa, Melosira italica, Stephanodiscus astraea, Stephanodiscus hantzschii.

Comparison of biological and chemical characteristics of Lough Neagh (Ireland) with those of other lakes shows that Lough Neagh is among the most eutrophic of the world's major lakes. Phosphorus appears to be the key factor which limits the growth of algae. It is estimated that Lough Neagh receives 300 tons of P per year, 70-80 percent of which is probably from urban and industrial sewage. It is concluded that reduction of P content of effluents from sewage works could have a beneficial effect on the eutrophic condition of the lake. (Little-Battelle)  
W73-08252

**STIMULATION OF PHYTOPLANKTON GROWTH BY MIXTURES OF PHOSPHATE, NITRATE, AND ORGANIC CHELATORS,**  
Virginia Inst. of Marine Science, Gloucester Point.  
R. A. Jordan, and M. E. Bender.  
Water Research, Vol 7, Nos 1/2, p 189-195, January/February 1973. 2 fig, 3 tab, 8 ref.

**Descriptors:** \*Nitrates, \*Phosphates, \*Growth rates, \*Bioassay, \*Primary productivity, \*Algae, Nutrients, Cultures, \*Michigan, Lakes, Phytoplankton, Phosphorus, Nitrogen, Diatoms, Chrysophyta, Cyanophyta, Chlorophyta, Aquatic algae.

**Identifiers:** \*Crystal Lake (Mich), Synedra nana, Fragilaria crotonensis, Synedra radians, Achmanthes, Synecocystis aquatilis, Rhodomonas minuta, Cyclotella ocellata, Cryptomonas ovata, Cyclotella stelligera, Pediastrum boryanum, EDTA, Nitzschia.

An *in situ* nutrient enrichment experiment was conducted in which mixed treatments of nitrate, phosphate, and EDTA were applied to natural lake phytoplankton communities. Changes in community productivity and species composition in response to the treatments revealed strong interactions among the components of the treatment mixture. On the community level, phosphate exerted a stimulatory effect that was reduced by EDTA, enhanced by nitrate, and enhanced even more by nitrate and EDTA together. Examination of 15 individual species revealed that the treatment effects were highly variable from species to species. Seven of the 15 species were stimulated by the nutrient treatments, and the growth patterns of 5 of these accounted for essentially all of the features of the productivity response patterns. The eight other species either failed to respond to any treatment or declined in response to containment or treatments. Phosphorus was the key substance in all of the positive treatment effects, and its omission from the treatment mixture essentially eliminated all growth responses. (Little-Battelle)  
W73-08253

**THE ROLE OF PHOSPHORUS IN THE GROWTH OF CLADOPHORA,**  
Aston Univ., Birmingham (England). Dept. of Biological Sciences.  
C. E. R. Pitcairn, and H. A. Hawkes.  
Water Research, Vol 7, Nos 1/2, p 159-171, January/February 1973. 7 fig, 8 tab, 13 ref.

**Descriptors:** \*Phosphorus, \*Growth rates, \*Bioassay, \*Eutrophication, \*Limiting factors, \*Cladophora, Water pollution effects, Nitrogen, Standing crops, Chlorophyta, Algae, Nutrients, Phosphates, Sewage, Cultures, Statistical methods, Rivers, Aquatic algae.  
**Identifiers:** \*Culture media, \*England.

An examination of river survey data showed standing crops of Cladophora to be correlated with phosphorus concentration. In general, river water containing less than 1.0 mg/l total inorganic P produced only modest growths of Cladophora. Culture experiments with supplemented river water confirmed the importance of phosphorus by showing that growth of Cladophora in waters upstream of sewage discharges could be increased to downstream levels by addition of phosphorus. Growth experiments in synthetic media containing levels of phosphorus from 1 to 7 mg/l indicated no significant growth increase above 1 mg P/l but a significant reduction below 1 mg P/l. In natural water, the maximum level of phosphorus for growth was found to vary, being 2.5 mg P/l at 3.2 mg N/l NO<sub>3</sub> and 0.95 mg P/l at 5.25 mg N/l NO<sub>3</sub>. A 3 x 4 factorial experiment utilizing synthetic media, confirmed an interaction between nitrogen and phosphorus. The highest level of NO<sub>3</sub> (7.7 mg N/l) enhanced growth at the lowest phosphorus level (0.5 mg P/l) but at higher levels of phosphorus, growth was reduced. The importance of such interactions is discussed briefly in connection with eutrophication and nutrient stripping. (Little-Battelle)  
W73-08254

**ROLE OF PHOSPHORUS IN EUTROPHICATION AND DIFFUSE SOURCE CONTROL,**  
Wisconsin Univ., Madison. Water Chemistry Program.  
G. F. Lee.  
Water Research, Vol 7, Nos 1/2, p 111-128, January/February 1973. 1 tab, 22 ref.

**Descriptors:** \*Eutrophication, \*Phosphates, \*Lakes, \*Limiting factors, \*Water pollution control, Bioassay, Cycling nutrients, Detergents, Algae, Arsenic, Sediments, Phosphorus, Nutrients, Absorption, Analytical techniques, Domestic wastes, Water pollution sources.  
**Identifiers:** Orthophosphates, Mobilization.

Many lakes and some streams and estuaries are showing signs of excessive fertilization due to the input of aquatic plant nutrients from man-associated sources. The key element often found limiting aquatic plant populations is phosphorus. The attempt to control phosphorus input to natural waters as the overall approach for controlling excessive fertilization is technically sound and economically feasible for many natural waters. However, a much better understanding of the relationship between the phosphorus input to a lake and the excessive growth of aquatic plants within the lake must be developed. This development will require a combined biological and chemical approach toward assessing the role of phosphorus in eutrophication for a specific water body. The biological approach will use tissue content, enzymatic and kinetic uptake analysis of phosphorus limitations as well as bioassays of phosphorus availability in order to determine the limiting nutrient for a body of water. The chemical approach will utilize amounts of each of the forms of phosphorus present in the lake and the rates of interchange of phosphorus between these various forms. There will be some waters where control of phosphorus from treatment of domestic waste water input and removal of phosphorus from detergents will not result in significant improvement in water quality. This is because these waters derive their phosphorus from diffuse sources, such as urban and rural stormwater drainage, the atmosphere and ground waters. In these instances, it may be necessary to initiate in-lake control of phosphorus by the addition of alum or iron salts. (Little-Battelle)  
W73-08255

**PHOSPHORUS IN PRIMARY AQUATIC PLANTS,**  
University Coll. of North Wales, Menai Bridge. Marine Science Labs.  
G. E. Fogg.  
Water Research, Vol 7, Nos 1/2, p 77-91, January/February 1973. 65 ref.

**Descriptors:** \*Algae, \*Phosphates, \*Limiting factors, \*Growth rates, \*Absorption, Nutrients, Cyanophyta, Metabolism, Chlorophyta, Chrysophyta, Rhodophyta, Diatoms, Phosphorus, Nutrient requirements, Aquatic plants.  
**Identifiers:** Orthophosphates, Biotransformation.

A review of the relationships between algae and phosphorus shows that many species can absorb orthophosphate from solutions containing less than 1 ppm P and, when phosphorus-deficient, most species are capable of producing powerful surface or extracellular phosphatases which enable them to obtain phosphate from a great variety of inorganic and organic phosphorus compounds, including synthetic detergents. In the presence of sufficient phosphate algal cells are able to accumulate a store of polyphosphate which suffices for several cycles of cell division in the absence of a further supply. As a result of excretion of phosphates at certain stages of the life cycle and extracellular phosphatase activity there is rapid recycling of phosphorus so that algal activity may be high even when the concentration of free phosphate in the water is low. Behavioral patterns may impose further complexity. There is evidence that planktonic blue-green algae possess a buoyance control mechanism operating via their gas vacuoles that may enable them to descend at night to phosphate-rich water at the bottom of the photic zone and rise nearer the surface in the morning. Because of these complications no clear relationships between the amount of algal growth

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Effects of Pollution—Group 5C

and the concentration of phosphate in an aquatic environment is to be expected. Because different species have different requirements for and tolerances towards phosphate, the prevailing concentration of this ion in a water body may play an important part in determining the composition of the flora it contains. Various simple methods for determining whether phosphate is limiting the growth of algae are now available and results obtained with these, together with knowledge of the minimum phosphorus requirements of algae and estimates of the phosphorus budget, may enable predictions to be made of algal crops in a given water body. (Little-Battelle)  
W73-08258

**PHOSPHORUS IN MARINE ZOOPLANKTON,**  
Marine Biological Association of the United Kingdom, Plymouth (England). Lab. E. D. S. Corner.  
Water Research, Vol 7, Nos 1/2, p 93-110, January/February 1973. 4 fig, 9 tab, 58 ref.

Descriptors: \*Copepods, \*Food habits, \*Food chains, \*Phosphorus, \*Absorption, \*Metabolism, Plankton, Zooplankton, Algae, Sea water, Cycling nutrients, Nutrients, Primary productivity, Growth rates.  
Identifiers: \*Excretion, Calanis, Macroinvertebrates, Feces, Mobilization, Biotransformation.

In the euphotic zone, phosphorus compounds dissolved in sea water are utilized by growing plants, many of which are subsequently eaten by herbivorous zooplankton and the dietary phosphorus invested partly in growth and egg production, partly released in insoluble form as faecal pellets and partly metabolized. The fraction metabolized is excreted back into the sea water mainly as inorganic phosphate, which is again available as a nutrient for the plants. Quantitative aspects of this cyclic process are reviewed with particular reference to the Calanoid copepods, animals of central importance to the marine food web in several sea areas. Most of the studies made so far have been concerned with animals feeding on algal diets. However, it is necessary to know more about the nutrition and metabolism of carnivorous zooplankton; and there is also a need for further work on the nutritive value of detritus. Much work has been done on the percentage assimilation of dietary phosphorus by zooplankton, and the values obtained are generally high. However, there is a need for further assimilation studies using particularly large algal cells, as well as microzooplankton, as the diets; and more information is needed concerning the assimilation of different phosphorus fractions and individual phosphorus compounds present in the food. There have been several investigations of the levels of soluble phosphorus compounds excreted by zooplankton. However, the precise way in which these substances, particularly 'organic' phosphorus compounds, are released by the animals deserves more investigation as does the chemical nature of these 'organic' phosphorus compounds and their possible use as nutrients by phytoplankton. The successful culturing of several species of zooplankton in the laboratory will pave the way for further studies of the factors affecting the gross growth efficiency of these animals in terms of phosphorus; and the data obtained could be useful in the formulation of mathematical models related to the production of zooplankton in the sea. There is also a need for work of a more biochemical nature, particularly the use of artificial diets in investigations of zooplankton nutrition and the development of methods for studying phosphorus metabolism at the tissue and cellular level. (Little-Battelle)  
W73-08259

**RIFLE ZOOBENTHOS IN STREAMS RECEIVING ACID MINE DRAINAGE,**  
Pittsburgh Univ., Pa. Graduate School of Public Health.

M. Koryak, M. A. Shapiro, and J. L. Sykora.  
Water Research, Vol 6, No 10, p 1239-1247, October, 1972. 4 fig, 16 ref.

Descriptors: \*Benthic fauna, \*Mine drainage, \*Acid streams, \*Invertebrates, \*Aquatic animals, \*Coals, Water pollution effects, Amphipoda, Oligochaetes, Biomass, Bioindicators, Aquatic insects, Larvae, Bottom sampling, Chemical analysis, Water analysis, Water velocity, Crustaceans, Annelids, Surface waters, Dissolved oxygen, Depth, Iron, Midges, Diptera, Water beetles, Mayflies, Stoneflies, Hydrogen ion concentration, Biochemical oxygen demand, Acidity.  
Identifiers: \*Receiving waters, Macroinvertebrates, Turtle Creek, Haymaker Creek, Trafford Road Run, Beyers Creek, Lyons Run, Atomic absorption spectrophotometry, Surber sampler, Riffles, Tendipes gr. riparius, Scuds, Ulothrix tenerima, Psychoda, Antocha.

For primary bibliographic entry see Field 05B.  
W73-08249

For primary bibliographic entry see Field 05B.  
W73-08249

**MIGRATION AND METABOLISM IN A TEMPERATE STREAM ECOSYSTEM,**  
North Carolina Univ., Chapel Hill. Dept. of Zoology.  
For primary bibliographic entry see Field 05B.  
W73-08303

**INFECTION BY ICHTHYOPHTHIRUS MULTIFILIS OF FISH IN UGANDA,**  
Makerere Univ., Kampala (Uganda). Dept. of Zoology.  
I. Paperna.  
Prog Fish-Cult. Vol 34, No 3, p 162-164, 1972. Illus.

Identifiers: Carp, \*Fish diseases, \*Ichthyophthirus multifilis, Infection, \*Uganda.

Infection by *I. multifilis* of fish in Uganda is reported for the first time from tropical Africa. Infection developed in fish from local fish ponds 7 days after being introduced into aquaria and 1 small outdoor pool. Many species of native fish were susceptible to infection while carp were fairly refractory. The possible sources of this infection are discussed.—Copyright 1973, Biological Abstracts, Inc.  
W73-08330

**ON THE ECOLOGY OF AN ADULT DIGENETIC TREMATODE PROCTOECES SUBTENUIS FROM A LAMELLIBRANCH HOST SCROBICULARIA PLANA,**  
I. C. White.

J. Mar. Biol. Assoc U.K. Vol 52, No 2, p 457-467, 1972. Illus.

Identifiers: Digenetic, Ecology, Host, \*Lamellibranch, Proctoeces subtenuis, Scrobicularia plana, \*Trematodes, \*Thames estuary.

*P. subtenuis* (Linton), an adult digenetic trematode parasite within the kidney region of the lamellibranch *S. plana* (da Costa) was found only in specimens of the host collected from localities along the north coast of the Thames estuary, although the lamellibranch was common in neighboring areas. An investigation of the *S. plana* from 8 locations along the north coast of the Thames estuary revealed that the abundance of the parasite was far from uniform with *S. plana* collected from certain localities being heavily infected whereas those collected from short distances away (one mile or less) were often only rarely infected. This pattern was repeated in each of the 3 yr of study. The investigation of a heavily infected population of *S. plana* over the period of study demonstrated that the parasite was very successful. From a level of infection of 2-3 *P. subtenuis* per host in 1967 an increase occurred to a level of infection in 1969/70 at which over 95% of all *S. plana* collected were infected and with an average of 4-5 *P. subtenuis* per host. As many as 14 *P. subtenuis* were recovered from a single host and it was demonstrated that the number of *P. subtenuis* per *S. plana* increased pari passu with the size of the host. As well as living parasites, dead but preserved *P. subtenuis* were found in the kidney region of some hosts but their significance is obscure.—Copyright 1973, Biological Abstracts, Inc.  
W73-08331

**EFFECT OF DRY SEASON DROUGHT ON UPTAKE OF RADIOACTIVE PHOSPHORUS BY SURFACE ROOTS OF THE OIL PALM (ELAEIS GUINEENSIS JACQ.),**  
University of the West Indies, St. Augustine (Trinidad).

For primary bibliographic entry see Field 021.  
W73-08334

#### THE INFLUENCE OF LOG HANDLING ON WATER QUALITY,

Oregon State Univ., Corvallis. Dept. of Civil Engineering.

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5C—Effects of Pollution

**MICROFLORA OF THE NEUSTON AND ITS ROLE IN WATER BODIES,**  
Polskie Towarzystwo Przyrodnicze im. Kopernika, Warsaw.  
S. Niewolak.

Wuzechswiat. 4 p 91-93. 1971.

Identifiers: \*Microflora, Algae, Bacteria, \*Neuston, Protozoa.

A significant role is played in the life of aquatic organisms by the surface water film of inland water bodies. This surface biocenosis is called neuston and is characterized by the presence of numerous bacteria, algae and protozoa. The surface microflora species found in the Ilawa Lakes are described, as also a number of microflora species found by other authors in the Black Sea. Results of chemical analyses of organic matter found in the surface water layer are given. The importance of the water-air phase in the development of surface water aquatic organisms is described. Biology of the surface water film is also discussed.—Copyright 1972, Biological Abstracts, Inc. W73-08335

**EFFECT OF ORGANIC AND MINERAL FERTILIZER ON THE HYDROCHEMICAL SYSTEM OF RICE PADDIES STOCKED WITH FISH WHICH WERE EXPOSED UNDER WATER VAPOR (IN RUSSIAN),**  
Z. F. Sorokina.

Ts Vses Nauchno-Issled Inst Prudovogo Rybn Khoz. 20: p 3-17. 1971. English summary.

Identifiers: \*Fertilizers, \*Fish farming, Humus, Paddies, \*Rice M, Vapor, Weeds.

Rice paddies were fertilized with different doses of mineral and organic fertilizers. The best results in fish and rice productivity were obtained with superphosphate in a dose of 180 kg active substance/ha. High doses of N fertilizer (180 kg of active substance/ha) had a negative effect. After raising fish for 2 yr on 'resting' (fallow) rice paddies the soil fertility increased, the content of organic matter increased by 30% and the humus content increased 2 times. The weediness of the rice fields decreased to 3-4% of the original amount.—Copyright 1972, Biological Abstracts, Inc. W73-08339

**THE CHEMICAL NATURE OF THE SUBSTANCES THAT INDUCE THE REDDENING OF LAKE TOVEL: III. STUDY OF A REMARKABLE PHENOMENON OF PRE-REDDENING (IN ITALIAN),**  
V. Gerosa.

Studi Trentini Sci Nat Sez B Biol, Vol 47, No 2, p 107-132. 1970. Illus, English summary.

Identifiers: \*Water pollution effects, Chemical properties, \*Glenodinium sanguineum, Lakes, Reddening, \*Lake Tovel, \*Cartogenes.

Initial carotenogenesis in the presence of large quantities of Glenodinium sanguineum and its relationship to the pre-reddening of Lake Tovel during the summer months is discussed.—Copyright 1972, Biological Abstracts, Inc. W73-08344

**EFFECTS OF FLOODING AND GASEOUS COMPOSITION OF THE ROOT ENVIRONMENT ON GROWTH OF CORN,**  
Illinois Univ., Urbana. Dept. of Agronomy.  
For primary bibliographic entry see Field 03F.

W73-08346

**STUDIES ON THE PRODUCTIVE STRUCTURE IN SOME LAKES IN KOREA, (IN KOREAN),**  
Seoul National Univ. (Republic of Korea). Dept. of Botany.

K. B. Uhm.

Korean J Bot. Vol 14, No 1, p 15-23. 1971. Illus. English summary.

Identifiers: Changia, \*Chlorophyll, Distribution, Hwajimpo, \*Korea, Lakes, Seasonality, Trophic type, Vertical stratification, Yongrang, \*Phytoplankton, \*Productivity.

The productivity of summer phytoplankton communities in Lake Hwajimpo, Lake Yongrang and Lake Changia was studied by measuring vertical variation of chlorophyll-a. Lakes were classified on the basis of the amount of chlorophyll in the water. In Lake Changia, the seasonal changes of stratification of chlorophyll were studied. In Lake Hwajimpo, the productive structure of the phytoplankton community in summer was found to be L-shaped and of the mesotrophic type. In Lake Yongrang, the productive structure of the phytoplankton community in summer was also L-shaped and of the mesotrophic type. And maximum chlorophyll layer was near the lake bottom below the compensation depth. In Lake Changia, the structure of phytoplankton community in summer was reversed L-shaped and of the eutrophic type, with the maximum chlorophyll layer just below the surface. The vertical distribution of chlorophyll amounts as a measure of the productive structure almost always formed a stratified distribution except in Sept. and sometimes in May, in Lake Changia. In Sept. homogeneous distribution was observed.—Copyright 1973, Biological Abstracts, Inc. W73-08402

**SEASONAL CHANGES IN PHYTOPLANKTON AND WATER CHEMISTRY OF MOUNTAIN LAKE, VIRGINIA,**  
Chana Univ., Legion. Volta Basin Research Project.

For primary bibliographic entry see Field 02H.  
W73-08404

**THE EFFECT OF KRAFT PULP MILL EFFLUENTS ON THE GROWTH OF ZALERION MARITIMUM,**  
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.

L. M. Chruchland, and M. McLaren. Can J Bot. Vol 50, No 6, p 1269-1273. 1972.

Identifiers: Effluents, Growth, Kraft mill effluents, Nutrients, \*Pulp wastes, \*Zalerion Maritimum, \*Aquatic fungi.

Growth of the marine fungus *Z. maritimum* was measured in Kraft pulp mill effluents. The effluents used were caustic effluent, acidic effluent, and acidic effluent adjusted to pH 8. The effluent and the seawater control flasks were supplemented, in some instances, with basal nutrients. Two concentrations of effluent, 50% (50% effluent, 50% seawater) and 100%, were used. When basal nutrients were added, dry weight was significantly greater (95% probability level) in 100% caustic effluent than in 50% caustic effluent or seawater alone. Without basal nutrients, growth was lower in 100% caustic effluent than in seawater or 50% effluent. This suggests that growth of *Z. maritimum* would not be stimulated by Kraft effluent under field conditions. Unlike the caustic effluent, the acidic effluent inhibited growth of *Z. maritimum*. With added nutrients, growth was lower in 50% and 100% acidic effluent than in seawater. When the acidic effluent solutions were adjusted to pH 8, growth was lower than in the seawater medium.—Copyright 1973, Biological Abstracts, Inc. W73-08426

**A YEARS' STUDY OF THE DRIFTING ORGANISMS IN A BROWNWATER STREAM OF ALBERTA, CANADA,**  
Alberta Univ., Edmonton. Dept. of Zoology.

H. F. Clifford. Can J Zool. Vol 50, No 7, p 975-983. 1972. Illus.

Identifiers: Alberta, \*Brown water streams, Canada, Cladocerans, Cyclopoids, \*Drifting

stream insects, Organisms, Ostracods, Streams, \*Entomostracans.

Ten 24-hr drift samples were taken from a brown-water stream of Alberta, Canada over a 1-yr period with drift nets having a mesh size of 320 micro. Cladocerans, cyclopoids, and ostracods, collectively called entomostracans, made up a large part of the drift by numbers and contributed substantially to the total biomass of the drift. Drift densities of entomostracans tended to increase as the ice-free season progressed, but drift densities of immature insects remained relatively constant throughout the ice-free season. Total daily drift of both the entomostracans and non-entomostracan fractions tended to decrease as the ice-free season progressed, being dependent on water volume. Drift densities, total daily drift, and number of taxa in the drift were very low in winter. Most of the species exhibited nighttime behavioral drift. At the sampling site, the entomostracans and immature aquatic insects were found to be essentially evenly distributed throughout the water column. For part of the study period, drift densities of taxa caught in the 320-micro net were compared with drift densities of the same taxa caught in a 720-micro net. The 720-micro net caught a much smaller fraction of the aquatic insects than did the 320-micro net, and almost all the entomostracans passed through the 720-micro net. When compared with other regional drift studies, the large fraction of entomostracans in the brown-water stream seems to be a unique feature; there is evidence that most of the drifting entomostracans originate in the marshy area drained by the main stream.—Copyright 1973, Biological Abstracts, Inc. W73-08427

**DRIFT OF INVERTEBRATES IN AN INTERMITTENT STREAM DRAINING MARSHY TERRAIN OF WEST-CENTRAL ALBERTA,**  
Alberta Univ., Edmonton. Dept. of Zoology.

H. F. Clifford.

Can J Zool. Vol 50, No 7, p 985-991. 1972. Illus.

Identifiers: \*Alberta, Canada, Chironomids, Cyclopoid, Draining, Drift samples, Harpacticoids, Intermittent streams, \*Invertebrates, Marshy land, Nauplii, Nematodes, Rotifers, \*Plankton.

Seven 24-hr drift samples were taken with a plankton net (pore size: 76 micro) over 1-yr period from an intermittent stream that drains marshy, muskeg-type terrain of west-central Alberta, Canada. The drift was mainly composed of planktonic and benthic animals originating in the marsh. The only abundant lotic taxon in the drift was simulid larvae. Rotifers and cyclopoid nauplii were numerically the most important taxa. Drift densities for the fauna as a whole tended to decrease as the ice-free season progressed, but there was no consistent correlation between drift densities and flow. However total daily drift across a point varied directly with flow. All the abundant taxa drifted more during the day than at night, and nematodes, harpacticoids, simulid larvae, chironomid larvae, chydorids, and rotifers were found in significantly ( $P < 0.05$ ) greater numbers in the daytime drift. Drift rates of taxa caught in the plankton net were compared with drift rates of the same taxa caught in a 320-micro drift net. Rotifers, entomostracans (especially the immature stages), and even small simulid and chironomid larvae would have been seriously underestimated using only the 320-micro net. The marshy areas via drift through the intermittent tributaries contribute a very large number of small organisms to the main stream. Draining the wetlands might have a pronounced detrimental effect on the main stream's ecosystem.—Copyright 1973, Biological Abstracts, Inc. W73-08428

**STUDIES ON BIOLOGICAL METABOLISM IN A MEROMICTIC LAKE SUIGETSU,**  
Nagoya Univ. (Japan). Water Research Lab.

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Effects of Pollution—Group 5C

M. Matsuyama, and Y. Saito.  
J Oceanogr Soc Jap. Vol 27, No 5, p 197-206. 1971.  
Illus.  
Identifiers: Bacteria, Biological studies, Japan, Lakes, Meromictic lakes, "Metabolism, Phytoplankton, "Lake Suigetsu (Japan).

Lake Suigetsu is a typical meromictic lake having a deep anoxic layer from 8 m to the bottom at 34 m depth. Lake accumulations of sulfide, total CO<sub>2</sub>, phosphate and ammonium were observed in the deep layer. In Aug., 2 photosynthesis maxima, caused by the activity of phytoplankton and photosynthetic sulfur bacteria, were observed at the surface and the boundary between aerobic and anoxic layers respectively. In Dec., a marked dark carbon fixation was observed at the boundary layer, although there was no indication of bacterial photosynthesis. Sulfate reduction was found only in bottom mud, especially near the surface of sediment. C and sulfur cycles and their interrelation in the anoxic layer are discussed.—Copyright 1973, Biological Abstracts, Inc.  
W73-08429

#### COMMUNITY STRUCTURE OF THE BENTHOS IN SCOTTISH SEALOCHS: I. INTRODUCTION AND SPECIES DIVERSITY, Dunstaffnage Marine Research Lab., Oban (Scotland).

J. Gage.  
Mar Biol (Berl). Vol 14, No 4, p 281-297. 1972. Illus.  
Identifiers: "Benthos, Diversity, Lochs, "Seas-Loches, Species, "Scotland.

The diversity of the macrobenthos was measured, using the rarefaction method of Sanders (1968), from bottom samples from Loch Etive, Loch Creran and the Firth of Lorne (Scottish west coast). Each sample (representing 1.6 m<sup>2</sup> of bottom area) was accumulated as a series of separate hauls taken consecutively in a systematic pattern with a van Veen grab. Two habitats were considered: soft mud and muddy sand. Within-habitat comparison of species diversity clearly indicates that diversity is lower in Loch Etive than in Loch Creran or the Firth of Lorne. The reasons for this are probably connected with the relatively high freshwater run-off into Loch Etive, possibly limiting the survival of planktonic larval stages of the benthos. The values of species diversity measured for the soft-mud areas in Loch Creran and the Firth of Lorne are thought to be representative for this habitat along the west coast of the British Isles. They agree well with the diversity predicted by Sanders for such a boreal inshore area, where a maritime climate prevails, on the basis of his time-stability hypothesis and the results of his sampling elsewhere.—Copyright 1973, Biological Abstracts, Inc.  
W73-08431

INFECTION OF BROWN SHRIMP, *NEAUS AZTECUS* IVES BY PROCHRISTIANELLA PENAEI KRUSE (CRESTODA: TRY PANORHYNCHA) IN SOUTHEASTERN LOUISIANA BAYS, Nicholls State Univ., Thibodaux, La.  
J. G. Ragan, and D. V. Aldrich.  
Trans Am Fish Soc. Vol 101, No 2, p 226-238. 1972. Illus.  
Identifiers: Bays, "Cestoda, Fishery, Infection, "Louisiana, *Penaeus-Aztecus*, *Penaeus-Setiferus*, Prochristianella-Penaei, "Shrimp (Brown), Southeastern U.S., Trypanorhyncha.

The plerocercus of the trypanorhyncha cestode, *P. panaei* was found to be a common parasite of commercially important shrimp (*P. aztecus* and *P. setiferus*) in southeastern Louisiana. During June and July 1967, the cestode was found in 42% of 971 subadult and large juvenile *P. aztecus* taken weekly from different estuaries. Infection of specimens from Lake Pontchartrain varied between 18% and 50% without a definite pattern,

but in Lake Borgne it rose suddenly from 38% to 89% and leveled off. In the delta complex west of the Mississippi River, it increased at a slower but more regular rate and reached a maximum of 63% in the last sampling week. Prochristianella penaei was found in 75% of 150 *P. setiferus* obtained from Lakes Pontchartrain and Borgne on 2 successive wk (July 24-Aug. 3) following a sharp decline in the availability of *P. aztecus*. Infection patterns of both species are discussed relative to the ecology of sampled areas and habits of hosts involved in the life cycle of *P. penaei*. Shrimp drawn concomitantly from different parts of a given estuary showed marked differences in infection. It appears that coarser substrata found at some stations may have been limiting to at least 1 host, possibly shrimp. No definite relationship was found between infection and length of either host in any of the estuaries sampled. Results are discussed relative to the potential utility of *P. penaei* as a living shrimp tag.—Copyright 1973, Biological Abstracts, Inc.  
W73-08433

#### SALICYLANILIDE I, AN EFFECTIVE NON-PERSISTENT CANDIDATE PISCICIDE, Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.

L. L. Marking.  
Trans Am Fish Soc. Vol 101, No 3, p 526-533. 1972.  
Identifiers: Cyprinids, Fishery, Ictalurids, Non-persistent, "Piscicides, "Salicylanilide, Salmonids, "Toxicity.

Salicylanilide I (2', 5-dichloro-3-tert-butyl-6-methyl-4'-nitrosalicylanilide) was tested for its toxicity to 20 spp. of freshwater fish in laboratory bioassays and to 15 spp. in outdoor pool bioassays. It is extremely toxic to all species of fish tested, and the 96-hr LC<sub>50</sub>'s range from 0.3 to 8.6 ppb in standard tests. Ictalurids are about as sensitive as salmonids to Salicylanilide I. Cyprinids are equally or more sensitive to the chemical than some percids. Salicylanilide I effectively kills fish at similar concentrations in soft and hard water, in cold or warm water, and in acid or alkaline water. In outdoor pools, Salicylanilide I killed all fish of 15 sp. at concentrations of 40 and 60 ppb and all fish of 12 sp. at a concentration of 20 ppb. The chemical detoxifies in water, but detoxification appears to be inhibited by colder temperatures. The broad spectrum piscicidal activity of Salicylanilide I in waters of various qualities and temperatures offers advantages over presently used fish toxicants.—Copyright 1973, Biological Abstracts, Inc.  
W73-08434

#### PHYSIO-MORPHOLOGICAL EFFECTS OF ABRUPT THERMAL STRESS ON DIATOMS, Smithsonian Institution, Washington, D.C. Office of Environmental Sciences.

G. R. Lanza, and J. Cairns, Jr.  
Trans Am Microsc Soc. Vol 91, No 3, p 276-298. 1972. Illus.  
Identifiers: "Diatoms, Ecology, Effluents, Electric plants (Steam), Microscopical surveys, "Morphological studies, Stress, Surveys, "Thermal pollution.

The physio-morphological effects of several categories of defined abrupt temperature increases on diatoms were evaluated. Temperature increases which could result from entrainment through cooling lines of steam electric generating facilities and downstream additions of thermal effluents were simulated. In addition to established criteria such as standard microscopical surveys on cell morphology and effects on population growth, a new approach involving total cellular fluorescent patterns was developed and initially tested in the measurement of cellular alterations following stress. The changes in cellular fluorescent patterns prior to and following severe internal cellular

destruction of diatoms are discussed, and ecological and physiological implications are indicated.—Copyright 1973, Biological Abstracts, Inc.  
W73-08441

#### SPECIES DIVERSITY OF MARINE MACROBENTHOS IN THE VIRGINIA AREA, Queensland Univ., Brisbane (Australia). Dept. of Zoology. For primary bibliographic entry see Field 021. W73-08445

#### ECOLOGY OF ARBOVIRUSES IN A MARYLAND FRESHWATER SWAMP: I. POPULATION DYNAMICS AND HABITAT DISTRIBUTION OF POTENTIAL MOSQUITO VECTORS, Walter Reed Army Inst. of Research, Washington, D.C.

E. S. Saugstad, J. M. Dalrymple, and B. F. Eldridge.  
Am J Epidemiol. Vol 96, No 2, p 114-122. 1972. Illus.

Identifiers: *Aedes-Canadensis*, *Aedes-Cantator*, "Arboviruses, *Culex-Salinator*, *Culesta-Melanurus*, Ecology, "Maryland, "Mosquito vectors, Vectors, Water pollution effects.

Entomological aspects of arbovirus ecology were studied in the Pocomoke Cypress Swamp in eastern Maryland. During 1969 nearly 350,000 adult and 10,000 larval mosquitoes were collected in the swamp and surrounding areas. *Aedes canadensis*, *Culesta melanurus*, *Culex salinator* and *A. cantator* accounted for 89% of the total adult catch. Analyses of variance of the capture rates of adults of these species demonstrated highly significant differences in capture rates between 5 habitats (based on vegetative differences) sampled for 3 out of the 4 species, but no significant differences between collection sites within the same habitats. In some instances, interhabitat differences in adult density were related to differences in suitable larval breeding sites; in other cases differences appeared related to the availability of suitable hosts for blood feeding. Population peaks of several species of mosquitoes coincided with the peak of virus activity in the swamp, but *C. melanurus* was the only species from which a group A virus was isolated. Fourteen isolates of Western Equine Encephalitis and 5 of Eastern were recovered from July 15 to Sept. 8, an average of 1 isolate for every 3,881 females. The significance of population dynamics and habitat distribution of the dominant mosquito species of the swamp to virus transmission is discussed. (See also W73-08447)—Copyright 1973, Biological Abstracts, Inc.  
W73-08446

#### RECURRENT ST. LOUIS ENCEPHALITIS INFECTION IN RESIDENTS OF A FLOOD PLAIN OF THE TRINITY RIVER, ROOSEVELT HEIGHTS (DALLAS, TEXAS), Texas Univ., Dallas. Southwestern Medical School.

J. P. Luby, and R. W. Haley.  
Am J Epidemiol. Vol 96, No 2, p 107-113. 1972. Illus.  
Identifiers: *Culex-Quinquefasciatus*, *Culex-Tarsalis*, Cycles, "Dallas, "Encephalitis (St. Louis), Equine, Floodplain, Infection, River, Texas, Trinity River (Tex.).

A serologic survey was conducted among nonwhite persons residing in a circumscribed community (Roosevelt Heights) in Dallas, Texas, situated on a flood plain of the Trinity River. In total, 214 sera were collected. St. Louis encephalitis (SLE) neutralizing antibody (Ab) was found in 13.6% of the sample and rates revealed a statistically significant trend to increase by length of residence, suggesting that this community had experienced recurrent SLE infection. Western equine encephalitis (WEE) Ab was found in 1.9% of the survey population. The finding of a commu-

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5C—Effects of Pollution

nity with recurrent SLE infection approximately 100 miles west of the towns that were previously investigated was thought basic to the epidemiologic proof that an interaction did exist between the 2 established transmission cycles for SLE virus in Texas (SLE, WEE-Culex tarsalis mosquitoes) and SLE-C. quinquefasciatus mosquitoes).—Copyright 1973, Biological Abstracts, Inc.  
W73-08448

### 5D. Waste Treatment Processes

#### A METHODOLOGY FOR PLANNING OPTIMAL REGIONAL WASTEWATER MANAGEMENT SYSTEMS,

Massachusetts Univ., Amherst. Water Resources Research Center.

D. D. Adrian, B. B. Berger, R. J. Giglio, F. C.

Kaminsky, and R. F. Rikkers.

Available from the National Technical Information Service as PB-219 388, \$6.75 in paper copy, \$1.45 in microfiche. Publication No. 26, (1972), 243 p, 19 fig, 10 tab, 81 ref, 7 append. OWRR B-011-MASS (10).

Descriptors: Waste water (Pollution), \*Regional economics, \*Planning, Methodology, Human population, Combined sewers, Interceptors, \*Cost allocation, \*Massachusetts, \*Decision making, Regional analysis, \*Treatment facilities, \*Construction costs, Optimal development plans, \*Regional development.  
Identifiers: Springfield (Mass), \*Capacity expansion.

The research described is directed towards the development of a methodology and mathematical/computer models which can aid planning agencies to make decisions concerning the development of regional wastewater management plans. The type of region under consideration is one in which a set of communities, commercial establishments, and industries discharge their treated effluent to a common stream. The regional plan produced by the methodology does not yield detailed engineering plans for each treatment plant to be constructed in the region. It does yield a long-range construction program for the region which has been determined to be best in such a way that a quality environment results with a reasonable expenditure of funds. The report is divided into the following sections: (a) Summary of results, (b) Needs for further work, (c) Planning methodology, (d) Using the methodology, (e) Appendices. The seven appendices describe: (a) Population dynamics, (b) Optimal interceptor networks, (c) Optimal facility location-service model, (d) Optimal timing of capacity expansions, (e) Spacing effluent discharges, (f) Combined sewer problems, (g) Apportioning costs among participants in regional systems.  
W73-07805

#### A KINETIC APPROACH TO BIOLOGICAL WASTEWATER TREATMENT DESIGN AND OPERATION,

Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.

A. W. Lawrence, and P. L. McCarty.

Available from the National Technical Information Service as PB-219 402, \$5.25 in paper copy, \$1.45 in microfiche. Technical Report No. 23, 1969. 56 p, 7 fig, 6 tab, 59 ref, 2 append. OWRR A-016-NY (4), 14-01-000-1-1400, 14-01-0001-1852, 14-31-0001-3032, 14-31-0001-3232.

Descriptors: \*Biological treatment, Sanitary engineering, Activated sludge, Anaerobic digestion, \*Design, \*Waste water treatment, Kinetics, Water quality control, Models studies.

A unified basis for design and operation of biological waste treatment systems employing suspensions of microorganisms is developed from

microbial kinetic concepts and continuous culture of microorganisms theory. Biological Solids Retention Time, average time period a unit of biological mass is retained in the system, is suggested as an independent parameter for process design and control. Biological Solids Retention Time is functionally related to process performance and is a readily controlled operational parameter. Steady-state kinetic models are presented for three process configurations, i.e., completely mixed reactor without solids recycle, completely mixed reactor with solids recycle, and plug flow reactor with solids recycle. Reported values of kinetic coefficients are tabularized for: (1) aerobic treatment of carbonaceous wastes, (2) aerobic biological nitrification, and (3) anaerobic methanogenic fermentation of carbonaceous wastes. These coefficient values are substituted into the models to determine lower limits, i.e., minimum values of Biological Solids Retention Time, for each process. Minimum values of Biological Solids Retention Time are compared with Biological Solids Retention Time values for actual treatment systems to identify the safety factors implicit in current design practice.  
W73-07809

#### DISCHARGES OF INDUSTRIAL WASTE TO MUNICIPAL SEWER SYSTEMS,

Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.

V. C. Behn.

Available from the National Technical Information Service as PB-219 361, \$3.00 in paper copy, \$1.45 in microfiche. Technical Report No. 60, February 1973. 18 p, 3 fig, 4 tab. OWRR A-017-NY (1), 14-01-0001-1400.

Descriptors: \*Industrial wastes, Industries, \*Waste water treatment, Cities, Legislation, \*Municipal wastes, New York, Rates, \*Combined sewers.

Studies by the Federal Government have shown that approximately one-fourth of industrial wastes are treated jointly with municipal wastes. A survey was made of ordinances and rate structures currently in use in New York State. A close examination shows that the ordinances are very similar in nature being mainly for the purpose of protecting the sewer system. Charges and surcharges are extremely variable. The basic charges from city to city can be as much as 10 to 1, while surcharges can vary by about 4 to 1. Thus, there is not much that can be accomplished within the existing framework insofar as joint treatment is concerned. However, the flow equalization step does lend itself to making the combined treatment more practical. By making flow equalization of industrial wastes mandatory through the mechanism of the sewer ordinance it is felt that municipalities will be in a much better position regarding accepting the industrial waste into their system. At the same time, attention could be paid to surcharges, with some relief given to firms who provide a uniform rate to the municipal sewer system.  
W73-07810

#### DEVELOPMENT OF MULTIPURPOSE WATER PURIFICATION UNIT FOR ARMY FIELD USE.

Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

For primary bibliographic entry see Field 05F.

W73-07833

#### AMMONIATED MIXED BEDS GIVE MIXED RESULTS,

E. Salem.

Power Engineering, Vol 75, p 52-55, March, 1971. 2 fig, 3 tab.

Descriptors: \*Waste water treatment, \*Water treatment, \*Separation techniques, \*Ion exchange, Resins, Anions, Cations, Economics,

Ammonium, Design criteria, Treatment facilities, Flotation, Water quality control, Water pollution control. Identifiers: \*Seprex, \*Sodium throw, \*Sulfate throw.

Many proposals have been made because of economic considerations that ammonium form cation exchange resin be substituted for the hydrogen form cation exchange resin in the condensate polisher mixed bed. Tests conducted and the results show that the performance of mixed beds containing ammonium form cation resins varies greatly with pH levels. Of all the resins tested none had a volumetric throughput in excess of 14 months of full power operation under today's normal design criteria. To cope with this problem, a new process called Seprex was developed which eliminates sodium and sulfate throw. This process involves separating the entrained cation from the anion resin by flotation. (Smith-Texas)  
W73-07834

#### THE CONTEMPORARY STATE OF DECONTAMINATING WASTE WATER,

V. YE. Privalov, S. N. Lazorin, and V. M. Kornienko.

Available from the National Technical Information Service as AD-747 514, \$3.00 in paper copy, \$1.45 in microfiche. Air Force Systems Command Foreign Technology Division Translation F70-MT-24-1460-71, April, 1972. 15 p, 2 tab, 20 ref. (Trans. of Koks i Khimiya, No 5, p 33-38, 1969).

Descriptors: \*Pilot plants, \*Water pollution, \*Phenols, \*Wastewater treatment, Chemical oxygen demand, Biological treatment, Oil wastes, Oil pollution, Water pollution treatment, Industrial wastes, Water supply, Lime, Decontamination. Identifiers: \*Russia, \*Coke plants.

On the basis of a study conducted by the World Health Organization, a review is given of water pollution that is caused by the coke chemical industry. By using active sludge at a pilot plant, an investigation was conducted to check on the purification of concentrated phenol wastewater. Performance data from this pilot plant are compiled in two tables. If the inflow of limed water into biological installations is eliminated, the average detention time of water in biological basins could be reduced 3 to 4 times, the rate of destruction of phenols rose 5 to 6 times, and the chemical oxygen demand was lowered 2-3 times. (Smith-Texas)  
W73-07835

#### ADVANCED STUDIES OF THE SUBMERGED ANAEROBIC FILTER FOR BREWERY PRESS LIQUOR STABILIZATION,

Kentucky Univ., Lexington.

E. G. Fore.

Available from the National Technical Information Service as PB-210 976, \$3.00 in paper copy, \$1.45 in microfiche. Technical Report UKY-48-72-CE14, 41 p, May, 1972. 9 fig, 2 tab, 14 ref.

Descriptors: \*Anaerobic treatment, \*Anaerobic bacteria, \*Filtration, \*Wastewater treatment, Industrial wastes, Chemical oxygen demand, Organic loadings, Water quality control, Water pollution control, Water pollution sources, Water quality.

Identifiers: \*Brewery press liquor waste, \*Anaerobic filter units.

The anaerobic filter process evaluated consisted of passing liquid brewery press waste upward through a submerged rock packed column. The rocks provide the microorganisms that are necessary for stabilization with suitable media upon which to attach themselves, which in turn insures a long solids retention time necessary for optimum treatment. The COD removal efficiencies stabilized above 90% for all loadings except for dropping below 30% when the filter was loaded at

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Waste Treatment Processes—Group 5D

400 lbs COD. The results indicated that the anaerobic filter can be used as a successful method of treating brewery press liquor waste at the loadings and buffering capacity studied. (Smith-Texas) W73-07836

#### THE EFFECTS OF DISPOSABLE DIAPERS PADDING MATERIAL ON MUNICIPAL WASTE TREATMENT PROCESSES.

Kentucky Univ., Lexington.

E. G. Force.

Available from the National Technical Information Service as PB-210 993, \$3.00 in paper copy, \$1.45 in microfiche. Technical Report UKY 47-72-CE13, April, 1972. 50 p, 9 fig, 4 tab, 12 ref.

Descriptors: \*Wastewater treatment, \*Waste treatment, \*Activated sludge, \*Sludge treatment, Chemical oxygen demand, Suspended solids, Disposal, Aerobic digestion, Anaerobic digestion, Municipal wastes, Biological treatment, Water pollution control.

Identifiers: \*Disposable diapers.

A laboratory study was conducted to evaluate the potential effects of the flushable portion of disposable diapers on the operation of commonly employed municipal wastewater treatment processes. Two laboratory scale plants were constructed and operated at a capacity of 24 liters per day each. One plant was operated as the control, while the second plant was operated under the same conditions with incremental contributions of diaper material, in addition. Each plant consisted of a primary clarifier, an activated sludge aeration basin, a secondary clarifier, and both an anaerobic digester and an aerobic digester as alternate means of sludge stabilization. Essentially 100% of the diaper material settled out in the primary clarifier and therefore, did not affect the secondary biological treatment processes. As a result of this study, it was felt that there will be no measurable effect on typical municipal wastewater treatment processes at present or in the near future due to diaper usage and the contribution of disposable diaper material to municipal wastewater streams. (Smith-Texas) W73-07837

#### A PRESENT VALUE-UNIT COST METHODOLOGY FOR EVALUATING WASTEWATER RECLAMATION AND DIRECT REUSE AT A MILITARY BASE OF OPERATION,

Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

V. J. Ciccone.

Available from the National Technical Information Service as AD 746 621, \$3.00 in paper copy, \$1.45 in microfiche. 1972, 36 p, 1 fig, 73 ref.

Descriptors: \*Cost analysis, \*Project benefits, \*Unit costs, \*Water reuse, Recycling, Mathematical studies, Mathematical models, Optimization, Water supply, Potable water, Water quality control, Water pollution, Waste water treatment.

Identifiers: \*Economic evaluation, \*Military bases.

The present value method of economic evaluation is applied to a water supply problem typical of a military operation. The concepts of reclamation and dual supply systems are introduced and presented as feasible alternatives. A hierarchy of water use is established with the highest quality intended for potable purposes. The difference in the calculated unit costs for the alternatives is examined over selected planning horizons. The difference in the calculated unit costs is input into the decision and policy making process for selecting an optimal system of water supply for the military base of operations. (Smith-Texas) W73-07838

#### WATER SUPPLY AND WASTE DISPOSAL SERIES, VOL 6, OXIDATION DITCH SEWAGE WASTE TREATMENT PROCESS,

Federal Highway Administration, Washington, D.C.

H. W. Parker.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price \$0.60. Staff Report, April, 1972. 52 p, 31 fig, 6 tab, 17 ref.

Descriptors: \*Oxidation lagoons, \*Oxidation, \*Waste water treatment, \*Waste treatment, Domestic sewage, Sewage treatment, Pilot plant, Water pollution control, Aeration, Sludge, Mixing, Research and development, Activated sludge, Biological treatment, Municipal wastes.

Identifiers: \*Roadside rest areas, \*Oxidation ditch.

Theory, design, specifications, construction, operation and testing of the oxidation ditch waste treatment process are described. The oxidation ditch waste treatment process was chosen for use at roadside rest areas because of its simplicity of operation, reliability of performance, ease of maintenance and cost advantage. It is also applicable to small domestic sewage plant use. It was found that the process had very few operational problems although some problems have occurred during intermittent operations. Therefore, the system should be activated and left in continuous operation. (Smith-Texas) W73-07839

#### BRACKISH WATER DESALINATED BY THE 'SIROTHERM' PROCESS,

For primary bibliographic entry see Field 03A.

W73-07840

#### PRACTICAL EXPERIENCE IN THE USE OF POLYELECTROLYTES,

Newcastle and Gateshead Water Co., Newcastle-upon-Tyne (England).

F. Bell.

Water Treatment and Examination, Vol 20, No 3, p 179-181, 1971. 6 ref.

Descriptors: \*Polyelectrolytes, \*Filtration, \*Alum, Water treatment, \*Waste water treatment, Head loss, Color, Water quality control, Water pollution control, Economics, Coagulation, Chlorination.

Identifiers: \*Filter aids.

The use of polyelectrolytes particularly as filter aids at the Henderson Filter Plant is described. Before the use of polyelectrolytes filter, runs had to be ended before maximum head loss was reached because of excessive penetration and breakthrough of color and residual alum in the water. These problems are solved with the use of polyelectrolytes as filter aids. In addition, they are more economical because of the slight reduction in the alum dose. (Smith-Texas) W73-07841

#### SLUDGE FILTER PRESSING AND INCINERATION AT SHEFFIELD,

Sheffield Corp., Wincobank (England).

For primary bibliographic entry see Field 05E.

W73-07842

#### A REGIONAL PLANNING MODEL FOR WATER QUALITY CONTROL,

Virginia Polytechnic Inst. and State Univ., Blacksburg.

For primary bibliographic entry see Field 05B.

W73-07918

#### DEACTIVATION OF RADIOACTIVE SEWAGE BY THE METHOD OF TWO-STEP COAGULATION OF FERRIC HYDROXIDE,

Ural Polytechnic Inst., Sverdlovsk (USSR).

V. L. Zolotavin, A. A. Konstantinovich, V. N. Sanatina, V. V. Pushkarev, and V. S. Petrov. Soviet Radiochemistry, Vol 13, p 167-169, 1971. 3 ref. (Trans. from Radiokhimiya, Vol 13, No 1, p 164-166, Jan-Feb 1971).

Descriptors: \*Iron compounds, \*Radioactive waste disposal, \*Waste water treatment, \*Flocculation, Filtration, Settling velocity, Sewage treatment, Filters, Chemical precipitation, Water pollution treatment.

Two-stage flocculation with iron sulfate proved more efficient than a single stage. The alpha radioactivity of the effluent was reduced from the initial value of 0.3-0.9 microCurie/liter to 0.1-0.9 nanoCurie/liter after stage 1, and to 24-60 picoCurie/liter after stage 2. The residual beta radioactivity was an order of magnitude higher. Comparable results were obtained in stage 1 by decantation after 24 hours settling, or by filtration through sand or filter paper after 2 hours aging. (Bopp-ORNL) W73-07937

#### WATER AND WASTE WATER STUDIES, 1971 (WASSER- UND ABWASSERCHEMISCHE UNTERSUCHUNGEN),

Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).

For primary bibliographic entry see Field 05A.

W73-07944

#### RADIOACTIVE EFFLUENTS FROM NUCLEAR POWERPLANTS (BETRIEBLICHE ABLEITUNGEN GEN RADIOAKTIVER STOFFE AUS KERNTECHNISCHEN ANLAGEN),

Technischer Ueberwachungs-Verein e. V., Cologne (West Germany). Institut fuer Reaktorsicherheit.

Available from NTIS, Springfield, Va., as IRS-T-23; \$3.00 paper copy, \$1.45 microfiche. Report IRS-T-23, July 1972. Proceedings of the Seventh Conference, Nov. 8-9, 1971, Köln, West Germany. 158 p.

Descriptors: \*Radioactivity effects, \*Nuclear wastes, \*Nuclear powerplants, \*Effluents, Europe, Conferences, Standards, Regulation, Water pollution control, \*Waste treatment, Monitoring, Forecasting, Environmental effects.

German nuclear powerplants under construction deliver Xe 40-60 days and Kr 2.5 days in charcoal absorption systems, which also remove iodine aerosols. The radioactivity of liquid effluents is reduced to less than 50 microCurie/cubic meter (by treatment by chemical precipitation, evaporation, deposition-filtration, and ion exchange) before discharge with the cooling water. The average dose to individuals living in the vicinity is about 1 mrem/year. The adequacy of the 30-mrem/year limit is discussed. English abstracts and the discussion following the papers are included. (Bopp-ORNL) W73-07952

#### RADIOACTIVITY AND WATER SUPPLIES,

Internuniversitair Reactor Instituut, Delft (Netherlands).

G. Lettinga.

Available from NTIS, Springfield, Va., as EUR-4866e. \$3.00 per copy, \$1.45 microfiche. Report No. EUR-4866e, 1972. 198 p, 98 fig, 54 tab, 250 ref.

Descriptors: \*Radioactive wastes disposal, \*Water pollution, \*Water pollution sources, \*Air pollution, \*Radioisotopes, Strontium, Cesium, Cobalt, Ruthenium, Iodine, Water pollution treatment, Assay, Adsorption, Ion exchange, Rivers, Peat.

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5D—Waste Treatment Processes

Identifiers: \*Netherlands.

An investigation has been made of the applicability of peat, chemically modified peat, clay and activated carbon for the removal of radionuclides (i.e., of Sr, Cs, Co, Mn, Ce, Ru, I) from aqueous solutions. Natural peat pairs a reasonable ion exchange capacity (approximately 1 meq/g at pH 6) with a pronounced specificity for higher valency cations, especially the cations of the transition elements and of the rare earth elements and for cationic Ru-complexes. Relative to the alkaline elements also the earth alkaline elements are sorbed with a high selectivity. However, within the last group a strong competing action exists between the various species, e.g., peat shows a slight preference for Sr over Ca only at pH <3.5. Strong indications were obtained that humic acids play a predominant part in the behavior of heavy metal ions in aqueous systems. By heating peat in air at a temperature of 120-160°C with either dilute or concentrated H<sub>2</sub>SO<sub>4</sub>, a product is obtained with strongly improved properties over the natural peat, i.e., ion exchange capacity (being 2-3.5 meq/g at pH 6), chemical and mechanical stability, swelling properties and selectivity for Sr relative to Ca. Modified peat therefore may be considered as eminently suitable for decontamination of radioactively contaminated aqueous solutions. For the removal of radiocesium some K-fixing Dutch clay deposits, such as Ammerzoden clay, can advantageously be applied. Radioiodine can be removed from aqueous solutions rather effectively by adding activated carbon +C12. (Houser-ORNL)

W73-0796

**AGRI-INDUSTRIAL PARK WATER IMPROVEMENTS, SEWAGE TREATMENT FACILITIES, BUSINESS DEVELOPMENT LOAN (FINAL ENVIRONMENTAL IMPACT STATEMENT).**

Economic Development Administration, Austin, Tex. Southwestern Region.

Available from the National Technical Information Service as EIS-TX-72-5127-F, \$9.00 paper copy, \$1.45 microfiche. August 18, 1972. 130 p, 4 fig, 3 map.

Descriptors: \*Texas, \*Environmental effects, Treatment facilities, Groundwater availability, Industrial wastes, Industrial water, Land use, Area redevelopment, Water supply, Sewage treatment, Economic impact, Groundwater resources. Identifiers: \*Environmental Impact Statements, \*Cactus (Tex.).

This project consists of an agri-industrial park, water improvements, sewage treatment facilities, and a business development loan in Cactus, Texas. Alternatives to this proposed development include a different site for the industrial park and no development. As a result of this project, 701 acres of unimproved range land would be converted to industrial use. Also, 145 acres of cultivated farm land would be converted to the site of a sewage treatment plant. The industries locating in the park would place an additional demand upon the ground water supply of the Ogallala aquifer. Noise, dust, and exhaust emissions would increase in the area both during and after construction. Additional demands would be placed upon the solid waste disposal facilities in the area. (Mockler-Florida)

W73-07978

**EFFECT OF INDUSTRIAL WASTES ON OXIDATION POND PERFORMANCE.**  
For primary bibliographic entry see Field 05C.

W73-08015

**INACTIVATION ASSAYS OF ENTEROVIRUSES AND SALMONELLA IN FRESH AND DIGESTED WASTE WATER SLUDGES BY PASTEURIZATION,**  
For primary bibliographic entry see Field 05C.

W73-08017

### WINERY INNOVATES WASTE TREATMENT.

Food Engineering, Vol 44, No 6, p 73-75, June 1972. 3 fig.

Descriptors: \*Waste water treatment, Water treatment, \*Treatment facilities, \*Sludge disposal, Ultimate disposal, Fertilizers, Effluents, Laboratory tests, Aeration, Biological treatment, Activated sludge, Sludge treatment, \*New York, Industrial wastes, Water pollution control, Food processing industry.

Identifiers: \*Widmer's Wine Cellars, Inc.

At a cost of more than 500,000 dollars, Widmer's Wine Cellars, Inc. located in New York State's Naples Valley, has completed and placed into operation a 3 acre industrial wastewater treatment facility that relies heavily on aeration. Four ten-foot deep aeration ponds are used to encourage bacterial growth and form activated sludge from waste material and natural decomposition. When solids level in the digester must be reduced, digested solids are pumped from the ponds to a tank truck and distributed throughout the vineyard for fertilizer. A new on-site laboratory continually tests effluents moving through the system. (Smith-Texas)

W73-08094

**THE ANAEROBIC FILTER FOR THE TREATMENT OF BREWERY PRESS LIQUOR WASTE.**  
Kentucky Univ., Lexington. Dept. of Civil Engineering.

E. G. Foree, and C. R. Lovan.

Available from the National Technical Information Service as PB-210 924, \$3.00 in paper copy, \$1.45 in microfiche. Technical Report UKY46-72CE 12, April, 1972. 52 p, 14 fig, 2 tab, 16 ref.

Descriptors: \*Waste water treatment, \*Waste treatment, \*Industrial wastes, \*Sedimentation, Organic wastes, Distillation, Filtration, Anaerobic bacteria, Anaerobic treatment, Filters, Trace elements, Chemical oxygen demand, Organic loading, Dissolved solids, Water pollution control, Water quality.

Identifiers: \*Brewery wastes, \*Brewery press liquor waste.

Spent grains from the lauter tub and hop strainer are collected in a press where they are concentrated for further drying and processing for cattle feed, in a typical brewing process. The waste liquor from this operation has a very high concentration of dissolved organics and moderately low concentration of suspended organics which can be readily removed by sedimentation and a high temperature, usually 125 to 130°F. This investigation was conducted to evaluate the performance of two laboratory scale filters. One was operated at a constant loading of 50 lbs. COD per thousand cu. ft. per day while the other filter load was increased to 100 lb. COD per thousand cu. ft. per day and the concentrations of buffering and trace element solutions were varied. Since COD removal efficiency of 90% or greater was achieved under all conditions and loadings, it was concluded that the anaerobic filter is a feasible means of treating brewery press liquor waste. (Smith-Texas)

W73-08095

**USE OF WASTE TREATMENT PLANT SOLIDS FOR MINED LAND RECLAMATION.**  
Illinois Univ., Urbana.

For primary bibliographic entry see Field 05E.

W73-08096

**TERTIARY EFFLUENT DEMINERALISATION.**  
PermitCo. Co. Ltd., London (England).

J. Grantham.  
Process Biochemistry, Vol 5, No 1, p 31-33 and 38, January 1970. 2 fig, 4 tab, 14 ref.

Descriptors: \*Waste water treatment, Water treatment, \*Tertiary treatment, \*Anion exchange, Treatment facilities, Separation techniques, Detergents, Cost comparison, Cost analysis, Pilot plants, Automation, Capital cost, Sewage treatment, Resins, \*Demineralization.

Identifiers: \*Anion resins.

This work is based upon current ion exchange demineralizing practice and shows that tertiary treated sewage can be demineralized to a quality suitable for industrial use at a cost comparable in terms of capital investment and running cost to that required for treating water from more conventional sources. A small scale semi-automatic pilot plant was set up and operated for 9 months demineralizing tertiary sewage effluent. The results show that it is practical and economic to abstract filtered sewage effluent direct from the outfall of a sewage works and demineralize it to a quality acceptable for industrial use using conventional water treatment type plants and isoporous anion exchange resins. The only problem of any significance concerns the accumulative effect of detergent on the performance of the anion resins. A cost analysis is included. (Smith-Texas)

W73-08097

**'LIQUID FERTILIZER' TO RECLAIM LAND AND PRODUCE CORPS.**  
Metropolitan Sanitary District of Greater Chicago, Ill.

For primary bibliographic entry see Field 05E.

W73-08098

**DESIGN OF TREATMENT FACILITIES FOR THE CONTROL OF PHOSPHORUS.**  
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.

F. M. Middleton.

Water Research, Vol 6, p 475-476, 1972. 1 fig.

Descriptors: Phosphorus, \*Design criteria, \*Treatment facilities, \*Waste water treatment, \*Biological treatment, Flocculation, Chemical reactions, Activated sludge, Sludge treatment, Lime, Alum, Iron compounds, Effluents.

Identifiers: \*Chemical treatment, \*Phosphorus control.

Biological removal enhanced by lime, alum, or iron compounds can produce effluents that meet new phosphorus standards. Facilities for chemical addition are easily constructed at existing plants. A 30 second flash mix followed by 1-5 minute high energy flocculation and a 5-20 minute low energy flocculation achieves good results. Costs are about 5 cents per 1000 gal for 80% removal. There are both advantages and disadvantages to addition of chemicals to the activated sludge treatment unit. (Anderson-Texas)

W73-08100

**FLOW VELOCITIES IN AERATION TANKS WITH MECHANICAL AERATORS.**  
Emschergenossenschaft, Essen (West Germany).

K.-H. Kalbskopf.

Water Research, Vol 6, p 413-416, 1972. 6 fig, 1 ref.

Descriptors: \*Settling basins, \*Aeration, \*Waste water treatment, \*Sludge treatment, Domestic wastes, Sewage treatment, Flow rates, Flow characteristics, Flow measurement, Flow profiles, Detergents, Critical flow.

Identifiers: \*Mechanical aerators.

Mechanical aerators produce a radial or spiral flow of surface water which then flows down the side of the tank and across the bottom. The flow velocity across the bottom must be rapid enough to prevent sludge settling. The critical velocity is different for municipal and industrial wastes and is affected by the detergent content of the waste. (Anderson-Texas)

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Waste Treatment Processes—Group 5D

W73-08101

**OXYGEN DIFFUSION IN WET AIR OXIDATION PROCESSES,**  
Naval Research Lab., Washington, D.C.  
W. W. Willman.

Available from the National Technical Information Service as AD-749 350, \$3.00 in paper copy, \$1.45 in microfiche. Operations Research Branch Report 72-4, August 1972. 11 p, 6 fig, 14 ref.

Descriptors: \*Waste water treatment, \*Waste treatment, \*Chemical oxygen demand, \*Oxygen generation, \*Dissolved oxygen, Activated sludge, Sludge treatment, Sewage treatment, Aeration, Oxygen demand, Treatment facilities.  
Identifiers: \*Wet air oxidation processes, \*Bubble column reactors.

An essential step in wet air oxidation processes is the diffusion of dissolved oxygen. An investigation was made of the conditions under which this diffusion step becomes a limiting factor for processes which use an air bubble column reactor for sewage treatment. The results show that the importance of oxygen diffusion as a rate limiting step depends mainly on reaction temperature and pressure, chemical oxygen demand, bubble diameter, air supply rate, and reactor height. The implication of these results for shipboard waste treatment processes currently being considered by the Navy are examined. (Smith-Texas)  
W73-08102

**USAF MOBILITY PROGRAM WASTE WATER TREATMENT SYSTEM,**  
Illinois Univ., Urbana.  
V. L. Snoeyink.

Available from the National Technical Information Service as AD-747 025, \$3.00 in paper copy, \$1.45 in microfiche. Air Force Weapons Laboratory Technical Report 71-169, April 1972. 210 p, 16 fig, 31 tab, 133 ref.

Descriptors: \*Waste water treatment, Water treatment, \*Waste treatment, \*Waste disposal, Sludge disposal, Reverse osmosis, \*Incineration, Industrial wastes, Domestic wastes, Chlorination, Flocculation, Aeration, Activated carbon, Filtration, Flotation, Water quality control, Water pollution control, Brines, Dilution, Settling basins.  
Identifiers: \*Photographic wastes.

The support systems for the U. S. Air Force Bare Base Mobility program which involves a highly mobile force of 1000 to 6000 men include a waste water treatment system which can treat waste water to the required degree prior to discharge to the environment. The treatment system involves: (1) separate collection and incineration of human waste and (2) treatment of all waste waters except concentrated photographic wastes in a system which includes chemical clarification, flotation, filtration, activated carbon adsorption and chlorination. The sludge concentrated photographic waste and the skimmings from the aircraft and vehicle washback waste are incinerated and the ash from the incinerator is disposed of on land. A reclamation system consisting primarily of a reverse osmosis process is recommended for upgrading the quality of the effluent from the waste treatment system such that it is suitable for reuse. The brine from the reverse osmosis treatment is disposed of either by dilution in receiving waters, evaporation from ponds or by transportation from the site. (Smith-Texas)  
W73-08103

**COST REDUCTION IN SULFATE PULP BLEACH PLANT DESIGN,**  
Improved Machinery, Inc., Nashua, N.H.  
J. K. Perkins.

Tappi, Vol 55, No 10, p 1494-1497, October 1972. 2 fig, 1 tab.

Descriptors: \*Design criteria, \*Water reuse, \*Recycling, \*Cost analysis, Cost comparisons, Operating costs, Capital costs, Piping systems, Design standards, Water quality control, Water pollution control, Water pollution sources, \*Pulp and paper industry, Treatment facilities.  
Identifiers: \*Sulfate pulp bleach plant.

For primary bibliographic entry see Field 05F.  
W73-08110

**DALLAS WATER UTILITIES,**  
Dallas Water Utilities Dept., Tex.  
For primary bibliographic entry see Field 05F.  
W73-08111

**ENGINEERING REPORT ON SHORE DISPOSAL OF SHIP GENERATED SEWAGE AT ACTIVITIES IN THE EASTERN AREA. VOLUME I.**

Reynolds, Smith and Hills, Jacksonville, Fla.

Available from the National Technical Information Service as AD-747 998, \$3.00 in paper copy, \$1.45 in microfiche. Report, June 1969. 179 p, 6 fig, 38 tab. N00025-69-C-0004.

Descriptors: \*Waste water treatment, \*Treatment facilities, \*Cost analysis, \*Annual costs, \*Construction costs, Cost comparisons, Unit costs, Water quality control, Water pollution control, Sewage treatment, Waste disposal, Economics, Ships, Saline water.  
Identifiers: \*Naval treatment systems, Engineering estimates, Shore disposal, Ship sewage.

This study was undertaken to provide engineering and cost data for shore disposal of ship generated sewage at 42 Naval activities in the Eastern area of the United States including Puerto Rico. Total capital expenditures required to provide shore disposal of ship sewage in the Eastern area would be \$10,078,000. Total cost for handling ship sewage from dockside is estimated at \$937,000 per year. The engineering and cost data developed in this study are summarized in a table. This investigation indicates that no serious effects are being experienced with sewage treatment processes exposed to high salt water concentrations introduced by infiltration and sea water flushing systems. The treatment processes accommodate to these high salt water concentrations with very little loss in treatment efficiency. Construction materials and protective coatings should be designed for the salt water environment. (See also W73-08113) (Smith-Texas)  
W73-08112

**ENGINEERING REPORT ON SHORE DISPOSAL OF SHIP GENERATED SEWAGE AT ACTIVITIES IN THE EASTERN AREA. VOLUME II.**

Reynolds, Smith and Hills, Jacksonville, Fla.

Available from the National Technical Information Service as AD-747 999, \$3.00 in paper copy, \$1.45 in microfiche. Report, June 1969. 213 p, 70 fig. N00025-69-C-0004.

Descriptors: \*Sewage treatment, \*Sewage disposal, \*Sewerage, \*Treatment facilities, \*Waste water treatment, Waste treatment, Ships, Water pollution sources, Water pollution control, Water quality control, Water pollution, Water quality.  
Identifiers: \*Sewerage systems.

Maps and drawings show existing conditions, ship berthing and proposed sewerage facilities for 40 activities under this study. Two berthing plans are shown for most of these activities, and are designated: (1) 'Design Maximum Loading of Individual Berthing Facilities', which shows the maximum berthing capability of each pier, wharf, and quay, and (2) 'Typical Berth Employment for a Maximum Day', which shows the maximum ship berthing experienced or expected at the port, except during a national emergency. These berthing plans were used to design the proposed sewerage systems as described in Volume I. Shore facilities to receive ship sewage have been constructed at the Naval shipyard Portsmouth, New Hampshire and Naval Training Center, Great Lakes, Illinois.

**TECHNOLOGIES FOR SHIPBOARD OIL-POLLUTION ABATEMENT: EFFECTS OF OPERATIONAL PARAMETERS ON COALESCENCE.**  
Naval Ship Research and Development Center, Annapolis, Md.

Available from the National Technical Information Service as AD-749 020, \$3.00 in paper copy, \$1.45 in microfiche. Report 3598, August 1972. 14 p, 9 fig.

Descriptors: \*Separation techniques, \*Coalescence, \*Filtration, Filters, Oil, Oil wastes, Flow rates, Water quality, Water quality control, Water pollution control, Water pollution, Ships, Research and development, \*Waste water treatment.  
Identifiers: \*Oil/water separator.

The way in which variations of certain operational parameters affected the coalescence subsystem, and the final stage of a three stage oil-water separator system is described. A study was made of cylindrical cartridge type coalescer elements made of resin coated glass fiber. Particulate matter very seriously limited the service life of a coalescer element. Oil viscosity was found to have a very strong effect, with heavier oils decreasing elements life. Increasing oil concentration also decreased the life of the element, but above a certain oil concentration this effect remained the same. No significant effects were noted on coalescer life with variations in the total flow rate in the range of 2 to 8 gallons per minute. (Smith-Texas)  
W73-08106

**STATE OF THE ART OF WATER FILTRATION,**  
American Water Works Association, New York. Committee on Filtration Problems.  
For primary bibliographic entry see Field 05F.  
W73-08107

**BUREAU OF RECLAMATION,**  
Bureau of Reclamation, Denver, Colo. Applied Sciences Branch.  
For primary bibliographic entry see Field 05G.  
W73-08108

**PHILADELPHIA SUBURBAN WATER COMPANY,**  
Philadelphia Suburban Water Co., Bryn Mawr, Pa.  
For primary bibliographic entry see Field 05F.  
W73-08109

**DETROIT METRO WATER DEPARTMENT,**  
Detroit Metro Water Dept., Mich.

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5D—Waste Treatment Processes

All figures contained in this volume are pertinent to and referenced from Volume I, and are arranged by Naval district. (See also W73-08112) (Smith-Texas)  
W73-08113

**DETECTION, DECONTAMINATION AND REMOVAL OF CHEMICALS IN WATER,**  
Edgewood Arsenal, Md. Army Development and Engineering Directorate.  
For primary bibliographic entry see Field 05A.  
W73-08114

**ACTIVATED CARBON IN TREATING INDUSTRIAL WASTES,**  
Westvaco Corp., Covington, Va.

A. W. Loven.

Proc available from the National Technical Information Service as AD-738 544, \$3.00 in paper copy, \$1.45 in microfiche. In: Proceedings of First Meeting on Environmental Pollution, 15-16 April 1970, Sponsored by American Ordnance Association, Edgewood Arsenal Special Publication EASP 100-78, February 1972, p 83-105, 11 fig, 13 ref.

Descriptors: \*Activated carbon, \*Filtration, \*Waste water treatment, Industrial wastes, Water pollution control, Adsorption, Water quality control, Water quality, Porosity, Design criteria, Pilot plants.  
Identifiers: \*Industrial waste treatment systems.

Adsorption on activated carbon is perhaps the most promising and widely acceptable process for the removal of dissolved organic compounds from waste water. Activated carbon adsorption principles are reviewed, and activated carbon processes, and activated carbon application to industrial waste water treatment are discussed. (Smith-Texas)  
W73-08115

**ACTIVATED CARBON IN POLLUTION CONTROL,**  
Calgon Corp., Pittsburgh, Pa.

G. V. Stone.

Proc available from the National Technical Information Service as AD-738 544, \$3.00 in paper copy, \$1.45 in microfiche. In: Proceedings of First Meeting on Environmental Pollution, 15-16 April 1970, Sponsored by American Ordnance Association, Edgewood Arsenal Special Publication EASP 100-78, February 1972, p 106-124, 6 fig, 2 tab, 6 ref.

Descriptors: \*Activated carbon, \*Water pollution control, \*Pollution abatement, \*Waste water treatment, Industrial wastes, Design criteria, Cost analysis, Biological treatment, Adsorption, Biochemical oxygen demand, Chemical oxygen demand, Water pollution, Water quality control.  
Identifiers: \*Industrial waste treatment systems.

The economical solution to industrial waste water problem with granular activated carbon is discussed. A polyvinyl chloride and rubber chemical plant was faced with the problem of removing heavy solids loading of polymer particles from the plastic polymer processes effluent and soluble organics from the rubber chemical plant effluent to meet the requirements of the receiving stream. Studies were conducted using 'Filtrasorb' granular activated carbon and biological methods of treatment. The results indicate that this treatment method can be considered as a definite means of treating polyvinyl chloride plastic and rubber chemical plants wastes. A cost analysis and design criteria of the treatment system are included. (Smith-Texas)  
W73-08116

**HEAVY METALS REMOVAL IN WASTE WATER TREATMENT PROCESSES: PART 1,**  
Orange County Water District, Santa Ana, Calif.  
D. G. Argo, and G. L. Culp.

Water and Sewage Works, Vol 119, No 8, p 62-65, August 1972, 3 tab, 15 ref.

Descriptors: \*Waste water treatment, \*Heavy metals, \*Water reuse, \*Recycling, Artificial recharge, Injection wells, Groundwater, Water supply, Water demand, Cost analysis, Water treatment, Water quality, Water pollution, Pilot plants, Trickling filters, \*California.  
Identifiers: \*Orange County Water District (Cal).

The Orange County Water District is investigating the feasibility of waste water reclamation because of increasing water demand and rising cost of imported water delivered to the Southern California area. Studies in waste water reclamation and groundwater recharge through injection wells has been conducted since 1965. Literature is reviewed to determine what is known about the reduction and concentration of heavy metals by waste water treatment and the efficiency of the Orange County Water Districts pilot scale waste water treatment plant for removing heavy metals from trickling effluent is evaluated. (Smith-Texas)  
W73-08117

**CONVERTING AMD TO POTABLE WATER BY ION EXCHANGE TREATMENT,**  
Chester Engineers, Inc., Coraopolis, Pa.  
W. Zabban, T. Fithian, and D. R. Maneval.  
Coal Age, Vol 77, No 7, p 107-111, July 1972, 3 fig, 1 ref.

Descriptors: \*Acid mine drainage, \*Industrial wastes, \*Ion exchange, \*Water reuse, \*Waste water treatment, Cation exchange, Anion exchange, Flow rates, Demineralization, Treatment facilities, Separation techniques, Costs, Potable water, Water supply, \*Pennsylvania.  
Identifiers: Counter current ion exchange.

Two small potable water treatment plants have been erected in Pennsylvania, for the purpose of converting acid mine drainage to potable water by ion exchange treatment. These treatment facilities consist of two continuous counter current ion exchange units, one for cation exchange and the other for anion exchange, designed to treat 500,000 gallons per day. Results have proved that this method of demineralization will result in a high quality, low total dissolved solids product costs are included. (Smith-Texas)  
W73-08118

**A MATHEMATICAL FORMULATION FOR SELECTING HOLDING-TANK-PROCESSOR REQUIREMENTS FOR SHIPBOARD SEWAGE TREATMENT,**  
M. U. Thomas.

Available from the National Technical Information Service as AD-747 065, \$3.00 in paper copy, \$1.45 in microfiche. July 1972, 22 p, 2 fig, 4 ref.

Descriptors: \*Waste water treatment, \*Waste treatment, \*Ships, \*Sewage treatment, \*Mathematical studies, Treatment facilities, Waste disposal, Sewage disposal, Water pollution control, Water pollution sources, Water quality control.  
Identifiers: \*Shipboard processors, \*Shipboard sewage treatment.

A descriptive framework is provided for the decision problem of selecting combined holding-tank-processor systems for shipboard sewage treatment. A mathematical formulation is described for examining tradeoffs between holding-tank capacity and processing rates of any proposed facility subject to the restrictions that all sewage generated must be processed. Following a general formulation of the problem, the first case considered is when the generation of sewage is assumed to be deterministic. In the second and more general case, the arrival streams are considered random, but assumed to follow a Poisson distribution. It is suggested that future studies be ad-

dressed to the problem of combining one or more holding-tanks with one or more processors. (Smith-Texas)  
W73-08119

**WALDHOF TYPE OF FERMENTORS IN DISPOSAL OF FOOD WASTES,**  
Iowa State Univ., Ames.  
G. T. Tsao, and W. D. Cramer.  
Chemical Engineering Progress Symposium Series, Vol 67, No 108, (1971), p 158-163, 10 fig, 5 ref. OWRR A-032-IA (10).

Descriptors: \*Waste disposal, \*Ultimate disposal, Industrial wastes, \*Waste water treatment, Treatment facilities, Aeration, \*Fermentation, Food processing industry, Foaming, Foam separation.  
Identifiers: \*Waldhof fermentor, \*Aeration rates.

The ability to handle materials that have strong foaming tendencies is one of the important characteristics of a Waldhof type of fermentor. It makes use of the foaming properties by continuous recycling of the foam and by obtaining extra aeration through the air-liquid interface in the foam. A study of the basic mechanisms of the Waldhof type of fermentors is reported. Important factors that affect the operation of a Waldhof type of fermentor and the experimental results, as well as theoretical developments, are included. These operational factors include air pumping by vortex in the system, aeration rate, effects of proteins and dissolved solids on oxygen absorption, foam aeration and foam formation. (Smith-Texas)  
W73-08120

**SPENT HCL PICKLING LIQUOR REGENERATED IN FLUID BED,**  
American Lurgi Corp., New York.  
P. Marnell.  
Chemical Engineering, Vol 79, No 25, p 102-103, November, 1972, 1 fig, 1 tab.

Descriptors: \*Industrial wastes, \*Waste treatment, \*Waste water treatment, Separation techniques, Iron compounds, Water pollution control, Water quality control, Water pollution, Water pollution treatment, Water quality standards.  
Identifiers: \*Fluid bed combustion, \*Acid.

A new regeneration technique known as fluid bed combustion has been adopted in a process developed and licensed by Lurgi Apparate-Technik Gmb H. The fluid bed operation has the advantages over other operations of smoother performance, a relatively dust free iron oxide product, and complete and continuous recovery of clean hydrochloric acid. These features will allow compliance with the stringent anti-pollution regulations currently being adopted by federal, state and local agencies. (Smith-Texas)  
W73-08121

**CHICAGO DEPARTMENT OF WATER AND SEWERS,**  
Illinois State Water Survey, Urbana.  
H. W. Humphreys.

Descriptors: \*Settling basins, \*Flow characteristics, \*Flow measurement, \*Flow control, Flow profiles, Flow system, \*Waste water treatment, Water treatment, \*Filtration, Water quality, Water quality control, Tracers, Flow rates, Treatment facilities, Separation techniques, \*Illinois.  
Identifiers: \*Chicago.

The Illinois State Water Survey, in cooperation with Chicago, is studying flow characteristics in a hydraulic model of one of the sixteen settling basins in the Central Water Filtration Plant. The objective is to improve flow conditions in the prototype settling basin in order to improve the quality of the settled water applied to the filter. The flow conditions in the model are studied by

measuring the velocity distribution in the settling basin and by making tracer studies. Although final conclusions cannot be made at this time, preliminary tracer results for several flow rates indicate a short circuiting in the settling basin. (Smith-Texas) W73-08122

**EUROPEAN METHODS OF COMPOSTING AND SLUDGE UTILIZATION,**  
For primary bibliographic entry see Field 05E.  
W73-08123

**WARWICK MINE NO. 2 WATER TREATMENT,**  
J. C. Draper, and R. E. McHugh.  
Mining Congress Journal, Vol 58, No 8, p 24-28,  
August, 1972. 2 fig, 3 tab.

Descriptors: \*Acid mine drainage, \*Lime, \*Waste water treatment, \*Water treatment, Sludge disposal, Waste disposal, Ultimate disposal, Tertiary treatment, Aeration, Pumping, Automation, \*Pennsylvania.  
Identifiers: \*Chemical treatment, \*Greene County (Pa).

Duquesne Light Company of Greene County, Pennsylvania, has begun lime treatment of mine water. Raw water was pumped from a four million gallon equalization tank into a reaction and aeration tank where it is mixed with lime slurry. The lime is delivered to the bin in pneumatic tank trucks. The resulting sludge is disposed of in an abandoned mine while the treated water is pumped to a polishing tank. A parallel plant has recently been added to increase capacity. Operating data for this plant and its several variations are not yet available. (Anderson-Texas)  
W73-08124

**THE ELIMINATION OF NITROGEN IN THE TREATMENT PLANT OF VIENNA-BLUMENTHAL,**  
Technische Hochschule, Vienna (Austria). Institut fuer Wasserversorgung Abwasserreinigung und Gewässerabschutz.

N. Matsche.  
Water Research, Vol 6, p 485-486, 1972. 1 fig, 1 tab, 3 ref.

Descriptors: \*Waste water treatment, \*Waste treatment, \*Water treatment, Aeration, Nitrogen, Organic loading, Denitrification, Optimization, Water quality control, Treatment facilities.  
Identifiers: \*Vienna-Blumenthal (Austria).

Nitrogen removal in two aeration basins was studied, with a removal efficiency of 88% being observed. Mean values of the loads are tabulated with a material balance, showing that 786 kg of nitrogen per day is eliminated. Denitrification was mainly influenced by the oxygen concentration in the basin. The process could possibly be optimized, but the obtained removal seems to be satisfactory. (Anderson-Texas)  
W73-08125

**WASTEWATER TREATMENT STUDIES IN AGGREGATE AND CONCRETE PRODUCTION,**  
Smith and Monroe and Gray Engineers, Inc., Lake Oswego, Ore.  
R. G. Monroe.

Copy available from GPO Sup Doc as EPI.23/2-73-003, \$1.25; microfiche from NTIS as PB-219 670, \$1.45. Environmental Protection Agency, Technology Series, Report EPA-R2-73-003, February 1973. 108 p, 45 fig, 3 tab, 4 ref, 3 append. EPA Project 12080 HBM.

Descriptors: \*Waste water treatment, \*Aggregates, \*Filters, \*Coagulation, Water reuse, \*Water purification, Treatment facilities, \*Concrete plants.

Identifiers: Aggregate settling ponds, Ready-mix settling basins, Filter ponds, Acid treatment.

Discussions are presented of various water clarification systems used in the aggregate and ready-mixed concrete industries. The overall problem of waste water disposition in each type of plant is studied. An analysis is made of the use of settling ponds, filter ponds and coagulants. Recycling and use of recycled water is discussed with recommendations for further study of the potential use of waste water from ready-mix plants for concrete batch water. Since many aggregate and ready-mix concrete now have effective clarification or recycling systems the overall purpose of the study is to make these systems known throughout the industry so proven systems can be made available to all. The report is based on a review of systems in reported 77 plants and firms plus data obtained from a field trip inspection of 88 plants on the West Coast. The study contains 45 charts and photographs of clarification systems. (EPA) W73-08126

**PHYSICAL-CHEMICAL TREATMENT OF COMBINED AND MUNICIPAL SEWAGE,**  
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

Alan J. Shuckrow, Gaynor W. Dawson, and William F. Bonner.

Copy available from GPO Sup Doc as EPI.23/2-73-149, \$2.35; microfiche from NTIS as PB-219 668, \$1.45. Environmental Protection Agency, Technology Series, Report EPA-R2-73-149, February 1973. 178 p, 88 fig, 31 tab, 14 ref, append. EPA Project 11020 DSQ. 14-12-519.

Descriptors: \*Activated carbon, \*Adsorption, \*Waste water treatment, \*Pilot plants, Alum, Coagulation, Polyelectrolytes, Filtration, Dewatering, Sewage treatment.

Identifiers: \*Combined sewage, Alum recovery, Carbon recovery.

The research program included laboratory process development of a unique physical-chemical waste water treatment process followed by design, construction, and field demonstration of a 100,000 gpd mobile pilot plant. In the treatment process, raw waste water is contacted with powdered carbon, coagulated with alum, settled with polyelectrolyte addition and, in some cases, passed through a tri-media filter. The solids from the clarifier, composed of raw sewage solids, powdered carbon, and aluminum hydroxide floc, are readily dewaterable to 20-25 percent solids by direct centrifugation with the powdered carbon acting as a substantial aid to dewatering. The dewatered solids are passed through a fluidized bed furnace developed specifically for powdered carbon regeneration. Alum is recovered by acidifying the regenerated carbon slurry from the furnace to a pH of 2. The recovered carbon and alum are recycled as an acidified slurry and added to the raw sewage with the makeup carbon. The program demonstrated the ability of the treatment process to consistently produce high-quality effluent from raw waste water. Powdered carbon regeneration was highly successful on the pilot scale. Full capacity recovery was achieved with less than two percent carbon loss per regeneration cycle. Alum recovery was also greater than ninety percent. (EPA) W73-08127

**COLOR REMOVAL FROM KRAFT PULP MILL EFFLUENTS BY MASSIVE LIME TREATMENT,**  
International Paper Co., Springhill, La.

L. Oswalt, and J. G. Land, Jr.

Copy available from GPO Sup Doc as EPI.23/2-73-086, \$1.25; microfiche from NTIS as PB-219 594, \$1.45. Environmental Protection Agency, Technology Series, Report EPA-R2-73-086, February 1973. 109 p, 21 fig, 14 tab, 10 ref, 4 append. EPA Project 12040 DYD. Grant 135-01 (R-1) (68).

Descriptors: Pulp and paper industry, Effluents, \*Waste water treatment, Color reactions, \*Lime,

\*Pilot plants, Operation and maintenance, \*Cost analyses, \*Pulp wastes, Foaming, Flocculation, Sedimentation rates, Chemical precipitation, Water reuse, Biochemical oxygen demand, Calcium carbonate, Feasibility studies, \*Capital costs, Bleaching wastes.

Identifiers: \*Color removal, Kraft decker effluent, \*Recarbonation.

A demonstration plant was installed and operated to determine effectiveness and feasibility of using massive lime treatment (that is, 20,000 ppm lime) to decolor kraft pulp mill effluents. The two most highly colored effluents and mixtures of these treated in the demonstration plant were: (1) the almost black effluent from the caustic extraction stage of pulp bleaching, and (2) the light reddish-brown effluent from the final unbleached pulp washing stage. Objectives were to determine: Effectiveness of color removal, design and performance of massive lime system equipment, effects of normal pulp mill operations, effects on pulp quality, operating costs. Impact of the massive lime system on a hypothetical 1000 tons-per-day bleached kraft pulp and paper mill is described. Using all the lime normally available in such a mill would allow massive lime treatment of four million of the mill's twenty-nine million gallons of effluent. Such treatment would remove 72% of the total mill effluent's color, reducing final effluent color to approximately 740 APHA units at an estimated operating cost of \$1.80 per ton of pulp (depreciation, insurance, and taxes included). (EPA) W73-08128

**RENOVATING SEWAGE EFFLUENT BY GROUNDWATER RECHARGE,**  
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.

H. Bouwer, J. C. Lance, and R. C. Rice.  
In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz. Printed by Colorado State University, Fort Collins, p 9-16, 1972. 3 fig, 2 tab, 14 ref.

Descriptors: \*Water reuse, \*Water spreading, \*Artificial recharge, \*Tertiary treatment, Groundwater recharge, Alluvial channels, \*Arizona, Hydrogeology.

In the Salt River Valley in central Arizona the performance of a system for renovating waste water by groundwater recharge depends upon the local conditions of climate, soil and groundwater. The hydrogeological conditions in Salt River Valley, central Arizona, are favorable for groundwater recharge with infiltration basins in the river bed. It is estimated that tertiary treatment by this method would cost about \$5 per acrefoot or less than one-tenth of equivalent in-plant treatment. This would be an additional source of water to meet future agricultural and other demands. (See also W73-08138) (Knapp-USGS) W73-08141

**WATER QUALITY ASPECTS OF THE STATE OF WASHINGTON, PART B,**  
Washington State Univ., Pullman.

B. W. Mar, D. A. Numallic, W. Mason, and M. Rapp.

Report No. 3B, June 1970. 207 p, 30 fig, 50 tab, 14 ref.

Descriptors: \*Surveys, \*Data collections, \*Water quality, \*Waste water treatment, \*Washington, Costs, Reviews, Waste water, Industrial wastes, Administration, Municipal wastes, Water pollution control, Waste water disposal, Sewage treatment, Treatment facilities.

As an amplification of An Initial Study of the Water Resources of the State of Washington, this study further examines the quality of State waters. Particular emphasis is placed on three areas: (1) an

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### Group 5D—Waste Treatment Processes

examination of water quality and management policies for water quality control, (2) a quantitative compilation of industrial, commercial and municipal wastes in the State, with flow charts of industrial and commercial processes and their relation to waste production, and (3) a comparison of waste treatment efficiencies by type of waste treated, along with costs. In each of the 24 major river basins examined, extensive bacteriologic treatment is necessary in order to meet coliform standards downstream from community discharges. For dissolved oxygen, secondary treatment was not adequate in half the rivers checked. In those cases where secondary treatment is too costly or insufficient, alternative treatment is suggested, along with river monitoring and modeling and a program of research to provide new techniques of technology and management. Eighteen types of industrial and commercial operations, as well as municipal waste treatment, are examined to assist in the development of waste treatment methods. Five methods of water treatment are compared for treatment efficiencies. (Poertner)  
W73-08178

#### WATER, SEWER AND STORM DRAINAGE PLAN FOR THE CUMBERLAND PLATEAU PLANNING DISTRICT.

Thompson and Litton, Inc., Wise, Va.  
For primary bibliographic entry see Field 06D.  
W73-08179

#### WATER AND SEWER PLAN.

West Alabama Planning and Development Council, Tuscaloosa.  
For primary bibliographic entry see Field 06D.  
W73-08181

#### REGIONAL WATER AND SEWER FACILITIES IMPROVEMENT PROGRAM.

Southeastern Illinois Regional Planning and Development Commission, Harrisburg.  
For primary bibliographic entry see Field 06D.  
W73-08184

#### DIGEST OF PROPOSED REGULATION RELATING TO MONITORING AND REPORTING WASTEWATER DISCHARGES AND THEIR EFFECTS UPON RECEIVING WATERS.

North Carolina Dept. of Natural and Economic Resources, Raleigh. (1971), 6 p.

Descriptors: \*North Carolina, \*Waste water discharges, \*Monitoring, \*Waste treatment, Waste water treatment, Water pollution sources, Sewage treatment, Treatment facilities, Measurement, Waste water (Pollution), Effluents, Sampling, Testing procedures, Municipal wastes, Industrial wastes, Effluent streams.

A monitoring system must be established for each waste water treatment plant. Such a system must include an effluent flow measuring device and flow recording device. Additionally, samples of the influent and effluent of each waste water treatment plant must be collected and analyzed. Moreover, samples at one or more upstream and downstream sampling points must be collected and analyzed. With reference to the reporting requirements, an annual survey report must be filed for each waste water treatment plant. Also, a monthly monitoring report must be filed for each waste water treatment plant listing the results of samples collected and analyzed in the past month. Several graphs and charts are included. (Mockler-Florida)  
W73-08202

#### CELL REPLICATION AND BIOMASS IN THE ACTIVATED SLUDGE PROCESS.

Illinois Univ., Urbana. Dept. of Sanitary Engineering.

For primary bibliographic entry see Field 05B.  
W73-08243

#### THE MICROBIOLOGY OF AN ACTIVATED SLUDGE WASTE-WATER TREATMENT PLANT CHEMICALLY TREATED FOR PHOSPHORUS REMOVAL.

Pennsylvania State Univ., University Park. Dept. of Microbiology.  
J. A. Davis, and R. F. Unz.  
Water Research, Vol 7, Nos 1/2, p 325-327, January/February 1973.

Descriptors: \*Phosphorus, \*Activated sludge, \*Microorganisms, \*Waste water treatment, Protozoa, Ciliates, Enteric bacteria, Analytical techniques, Phosphates, Cultures, Sewage bacteria, Streptococcus.  
Identifiers: \*Alum, Removal, Culture media, Flagellates.

Microbiological research was conducted on a dual, secondary wastewater treatment system which was part of the Pennsylvania State University wastewater treatment plant. Each aeration basin received identical wastewater which was the effluent from a high rate trickling filter. One of the aeration basins was dosed with aluminum sulfate for the purpose of phosphorus removal. The other aeration basin (control) was operated in the conventional manner without alum addition. Plate counts performed on combined chemical-biological sludge and control activated sludge revealed that a higher number of viable microorganisms was contained in the chemical-biological sludge, but the magnitude of difference between the two sludges was significant depending on the culture medium employed. Results suggest the aluminum flocs formed in the chemical-biological treatment enmesh dispersed wastewater microorganisms, some of which are qualitatively unlike those indigenous to natural activated sludge. The combined chemical-biological sludge contained significantly higher numbers of lipolytic, gelatinolytic, and thiosulfate oxidizing microorganisms and, possibly, fewer nitrite oxidizing microorganisms than did control activated sludge. Alum did not appear to affect flagellated protozoa in mixed liquor; however, amoeboid and ciliated protozoa were found less frequently in alum dosed than in control mixed liquor. The settled effluent from the combined chemical-biological aeration basin generally contained fewer total coliforms, fecal coliforms, and fecal streptococci than did counterpart control effluents. (Little-Battelle)  
W73-08250

#### EXPERIENCE WITH ALGAL BLOOMS AND THE REMOVAL OF PHOSPHORUS FROM SEWAGE.

For primary bibliographic entry see Field 05C.  
W73-08251

#### ACTIVATED CARBON TREATMENT OF RAW SEWAGE IN SOLIDS-CONTACT CLARIFIERS.

Westinghouse Electric Corp., Richmond, Va. IN-FILCO Div.  
R. L. Beebe.

Copy available from GPO Sup Doc as EP1.23/2-73-183, \$1.25; microfiche from NTIS as PB-219 883, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-183, March 1973. 98 p., 34 fig, 8 tab, 14 ref, append. EPA Project 17050 EGI, 14-12-586.

Descriptors: \*Waste water treatment, \*Adsorption, \*Activated carbon, \*Sewage treatment, Flocculation, Filtration, Chemical analysis, Waste treatment, Cost, Settling rates, Pilot plants, Adsorption.  
Identifiers: Series clarifier countercurrent adsorption.

Degritted raw municipal sewage was treated with powdered activated carbon in a 28,000-gpd pilot

plant. Two high-rate recirculating-slurry solids-contact clarifiers operating in series with countercurrent carbon advance, followed by a gravity polishing filter, produced effluent equal to or better than that produced in a parallel activated sludge plant. TOC and COD removals averaged 88.1 and 88.7 percent, respectively, with higher removals hindered by the concentration of adsorptive-resistant materials present. Filtrable-TOC and -COD removals were 68.0 and 69.9 percent, respectively. Alum and polyelectrolyte flocculated the powdered activated carbon and raw sewage suspended solids into a fast settling floc. Subsidence tests conducted on the solids slurry from the ACCELERATOR draft tube indicated ACCELERATOR overflow rates equivalent to or greater than 2.5 gpm/ft<sup>2</sup>. The maximum carbon adsorptive capacity for filtrable COD was 0.50 to 0.55 g COD/g carbon. This capacity was achieved whenever the concentrations of influent COD and carbon matched or exceeded that ratio (adsorptive-resistant COD excluded). Carbon requirements were 55 to 60 percent of theoretical two-stage countercurrent adsorption system requirements. Assuming regeneration cycles 85 percent of the carbon feed, respectively treatment cost estimates for 10-mgd and 100-mgd plants were 13.9 cents and 11.2 cents per thousand gallons. (EPA)  
W73-08287

#### THE DISPOSAL OF CATTLE FEEDLOT WASTES BY PYROLYSIS.

Midwest Research Inst., Kansas City, Mo.  
W. Garner, and I. C. Smith.  
Environmental Protection Agency, Technology Series Report EPA-R2-73-096, January 1973. 99 p., 16 fig, 9 tab, 27 ref, 4 append. EPA Project 13040 EGH; Contract No. 14-12-850.

Descriptors: \*Waste disposal, \*Farm wastes, Feedlots, \*Cattle, Chemical analysis, Organic compounds, Cost analysis, Gases, \*Waste treatment.  
Identifiers: \*Pyrolysis, \*Gas condensation.

Beef cattle (steer) manure was obtained from a source that was free of soil contamination, and subsequently dried and pulverized. Replicate batch pyrolyses were carried out in stainless steel, glass, and iron tubes utilizing axial flow, at various levels of elevated temperature, and at atmospheric and lower pressures. Exhausts were carried by inert gas to traps and condensers. Qualitative separations and extractions were performed to determine the presence and quantity of various gases, ash, tar, and organics. Many constituents were extracted, but in such quantities that their value may not pay for the cost of pyrolyzing. Larger scale pyrolyzing units should be tested to either confirm or disprove these findings. (EPA)  
W73-08290

#### PILOT PLANT FOR TERTIARY TREATMENT OF WASTE WATER WITH OZONE.

Air Reduction Co., Inc., Murray Hill, N.J.  
Research and Engineering Dept.

C. S. Wynn, B. S. Kirk, and R. McNabney.  
Copy available from GPO Sup Doc as EP1.23/2-73-146, \$2.60; microfiche from NTIS as PB-219 877, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-146, January 1973. 229 p., 59 fig, 20 tab, 22 ref, 7 append. EPA Project 17020-DYC, WQO 14-12-597.

Descriptors: \*Ozone, \*Tertiary treatment, \*Waste water treatment, \*Pilot plants, \*Chemical oxygen demand, Optimization, Water treatment, Oxygen, Evaluation, Cost analysis.  
Identifiers: \*Washington, D.C.

Tertiary treatment of waste water with ozone in a nominal 50,000 gal./day pilot plant at Blue Plains, Washington, D.C., is described. Plant feeds (10 to 100 ppm COD) were effluents from other pilot

processes involving nine different biological and physical treatments of the Blue Plains waste water. Major COD reductions were realized, and product water was sterile and oxygen saturated. The pilot plant used three major process steps: (1) generation of ozone gas from oxygen, including preconditioning of the gas feed and means of recirculating the gas; (2) dissolution of ozone from the oxygen carrier gas into the water; and (3) retention of the ozonated water for a period sufficient for the organic contaminants to be oxidized. Plant performance for each feed is described in terms of COD reduction characteristics and the effects of pH, ozone concentration, feed pretreatment and initial COD on reaction rate. Data are given for ozone solubility and half-life in pure water and various waste waters. Bacteria kills are reported. Estimates of capital and operating costs are presented for large plants to treat waste water with ozone and a procedure is given for optimization of costs for large plants. (EPA) W73-08291

#### FIELD STUDY OF NITRIFICATION WITH THE SUBMERGED FILTER,

Stanford Univ., Calif. Dept. of Civil Engineering. D. D. McHarness, and P. L. McCarty.

Copy available from GPO Sup Doc as EPI.23/2:73-158, \$1.25; microfiche from NTIS as PB-219 878, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-158, February 1973. 101 p., 18 fig., 21 tab., 22 ref., 4 append. EPA Project 17010 EPM.

Descriptors: \*Nitrification, \*Biological treatment, \*Oxygen, Municipal wastes, \*Waste water treatment, Alkalinity, Solid wastes, \*Filters, Filtration, Aeration, Activated sludge, Suspended solids, Biochemical oxygen demand.

Identifiers: \*Stage treatment, \*Packed column, Field evaluation, Temperature effect.

This study demonstrated the feasibility of a column packed with one-inch rock media to retain nitrifying organisms on the media surface. Kinetic rates of the nitrification reaction in secondary effluent, using two modes of oxygen aeration, were studied. Successful and reliable nitrification of secondary activated sludge effluent was demonstrated using a pilot size packed media column. Ninety percent reduction of ammonia nitrogen and residual BOD and suspended solids of less than 10 mg/l were obtained with a detention time of one hour. Two methods of oxygen introduction were evaluated. One system involved preoxygenation with pure oxygen at one atmosphere of pressure, and required recycle of treated effluent because of the limited oxygen solubility. This system achieved the greatest efficiency of BOD and solids removal, and was most reliable. This system did have a tendency to clog at high influent solids levels. The other system, which employed direct bubbling of oxygen into the column, was only slightly less efficient and did not suffer from the clogging tendencies of the recycle system. (EPA) W73-08292

#### CANNERY WASTE TREATMENT BY ANAEROBIC LAGOONS AND OXIDATION DITCH,

Melbourne Water Science Inst. Ltd., Carlton (Australia).

C. D. Parker, and G. P. Skerry.

Copy available from GPO Sup Doc as EPI.23/2:73-017, \$2.10; microfiche from NTIS as PB-219 823, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-017, February 1973. 110 p., 8 fig., 41 tab., 4 ref., 4 append. EPA Project 12060 FHS (WPD 211-02-68).

Descriptors: Industrial wastes, \*Canneries, \*Waste water treatment, \*Activated sludge, \*Anaerobic digestion, Lagoons, Aeration, Capital costs, Operating costs, Sewage treatment, Organic loading, \*Oxidation lagoons, Biochemical oxygen demand.

Identifiers: Oxidation ditch, \*Anaerobic lagoons, \*Food processing wastes, Combined treatment.

Various mixtures of fruit and vegetable cannery wastes, and domestic sewage were treated by anaerobic lagoons followed by an oxidation ditch for a two-year period. The anaerobic lagoons consistently achieved BOD reductions of 75 to 85 percent at loadings up to 400 lbs BOD/day/acre provided adequate inorganic nutrients were present. The oxidation ditch reduced the BOD to low levels and was shown to be very stable against overload. Power requirements were less than 0.5 kw.hr/lb of BOD removed and the oxygenation capacity of the rotor was about 30 lbs of BOD per foot of length. (Dostal-EPA) W73-08293

#### TREATMENT OF FERROUS ACID MINE DRAINAGE WITH ACTIVATED CARBON,

Bituminous Coal Research, Inc., Pittsburgh, Pa.

C. T. Ford, and J. F. Boyer.

Copy available from GPO Sup Doc as EPI.23/2:73-150, \$2.10; microfiche from NTIS as PB-219 826, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-150, January 1973. 123 p., 17 fig. EPA Project 14010 GHY.

Descriptors: \*Acid mine water, \*Waste water treatment, \*Activated carbon, Iron compounds, Oxidation, Adsorption, Ferrobacillus, \*Mine drainage, Aeration, Coal mine wastes, Cost analysis.

Identifiers: \*Iron removal, Oxidation catalyst.

Laboratory studies were conducted with activated carbon as a catalyst for oxidation of ferrous iron in coal mine water. Batch tests and continuous flow tests were conducted to delineate process variables influencing the catalytic oxidation and to determine the number and types of coal mine water to which this process may be successfully applied. The following variables influence the removal of iron with activated carbon: (a) amount and particle size of the carbon; (b) pH, flow rate concentration of iron, temperature, and total ionic strength of the water; and (c) seration rate. Adsorption as well as oxidation are the mechanisms involved in iron removal by this process. An evaluation of this process indicated technical feasibility which would permit acid mine drainage neutralization using an inexpensive reagent, such as limestone. The major disadvantage is the cost of the activated carbons since they are rendered inactive after relatively short use by apparently irreversible adsorption of iron. This cost appears to be sufficiently high to prohibit the use of this process for treating coal mine drainage. (EPA) W73-08294

#### MICROSTRAINING AND DISINFECTION OF COMBINED SEWER OVERFLOWS—PHASE II,

Crane Co., King of Prussia, Pa. Environmental Systems Div.

G. E. Glover, and G. R. Herbert.

Copy available from GPO Sup Doc as EPI.23/2:73-124, \$2.10; microfiche from NTIS as PB-219 879, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-124, January 1973. 116 p., 32 fig., 8 tab., 30 ref., 4 append. EPA Program 11023 FWT.

Descriptors: \*Sewers, \*Storm runoff, \*Filtration, Water pollution control, \*Cost comparisons, Water quality, Ozone, Chlorine, Biochemical oxygen demand, Waste water treatment, Screens, Disinfection.

Identifiers: \*Microstraining, \*Combined sewer overflow, \*Suspended solids removal, \*Philadelphia.

A microstrainer using a screen with 23 micron apertures reduces the suspended solids of the combined sewer overflow from 50 to 700 mg/l

down to 40 to 50 mg/l levels operating at flow rates of 35 to 45 gpm/ft<sup>2</sup> of submerged screen. The organic matter as measured by COD and TOC was reduced 25 to 40%. Coliform concentrations were 0.1 to 9 million cells per 100 ml and no reduction was brought about by Microstraining. Stormwater service requires special analytical techniques which are described in detail. The coliform concentrations of both overflow and microstraining overflow were reduced by four or more orders of magnitude by disinfection with 5 mg/l chlorine in specially built, high rate, contact chambers of only 2 minutes contact time. The drainage area served by the combined sewer comprises 11.2 acres of a residential area in the City of Philadelphia having an average dry weather sanitary flow of 1000 gph. The overflow rates recorded were generally 100 times, with a maximum 400 times, the average dry weather flow. The extreme importance of very low 2 minute residence volume equipment for suspended solids removal and for disinfection in the very high instantaneous rates encountered with stormwater is shown. The cost of a microstrainer—special chlorine contact chamber installation is cited as \$6,750/cfs of peak flow rate capacity less land and engineering. On the basis of 2 cfs instantaneous design overflow per acre this is \$13,100/acre. (EPA) W73-08295

#### KRAFT EFFLUENT COLOR CHARACTERIZATION BEFORE AND AFTER STOICHIOMETRIC LIME TREATMENT,

Institute of Paper Chemistry, Appleton, Wis. Div. of Natural Materials and Systems.

J. W. Swanson, H. S. Dugal, M. A. Buchanan, and E. Dickey.

Copy available from GPO Sup Doc as EPI.23/2:73-141, \$1.00; microfiche from NTIS as PB-219 827, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-141, February 1973. Project 12040 DKD.

Descriptors: \*Pulp wastes, \*Waste water treatment, \*Industrial wastes, Pollution abatement, Waste water (Pollution), Effluents, Water reuse, Chemical analysis, Color.

Identifiers: \*Lime treatment, \*Kraft colors, Kraft effluent, Decker effluent, Kraft decker effluent, \*Molecular weights, \*Color characterization, Color isolation.

The lime-treatment process was found to remove on an average about 86 percent of the color, 57 percent of the total organic carbon, and 17 percent of total sugars from the waste effluent during the period of approximately 15 months over which the samples were collected. No appreciable change in chloride content was noticed. The weight average molecular weights (Mw) of untreated acid-insoluble fractions varied from < 400 to 30,000 and of the untreated acid-soluble, lime-treated acid-insoluble, and lime-treated acid-soluble fractions from < 400 to 5000. The study shows that color bodies having an apparent Mw of < 400 are not removed by lime treatment and those having Mw of 5000 and above are completely removed. The intermediate range of Mw 400 to 5000 apparently undergoes partial removal. Infrared spectroscopy data indicate that the acid-insoluble color bodies (high Mw) contain a high proportion of conjugated carbonyl groups where conjugation with an aromatic ring is probable. The acid-soluble fractions (low Mw) seem to contain nonconjugated carboxyl groups and may be associated with carbohydrate material. However, color bodies are found to be aromatic in nature (partially degraded lignin), possess a negative charge, and exist primarily as soluble sodium salts in aqueous solutions. The color bodies which are not removed by lime treatment have low Mw, high nonconjugated carboxyl groups, some lignin-like character, and seem to be associated with colorless carbon compounds. (EPA) W73-08296

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5D—Waste Treatment Processes

**PROBLEMS OF COMBINED SEWER FACILITIES AND OVERFLOWS, 1967.**  
American Public Works Association, Chicago, Ill.  
For primary bibliographic entry see Field 05G.  
W73-08299

**TURBOVENTILATOR FOR THE INPUT OF OXYGEN INTO LIQUIDS.**  
FMC Corp., San Jose, Calif.  
K-H. Kalbskopf.  
U. S. Patent No. 3,704,009, 7 p, 18 fig, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 904, No 4, p 531, November 28, 1972.

Descriptors: \*Patents, \*Waste water treatment, \*Aerators, Equipment, \*Oxygenation, Ventilation, Pollution abatement, Water quality control.  
Identifiers: \*Turboventilators.

Water is formed into long lasting aeration-jet streams by means of jet producing devices. The aerator comprises circumferential spaced jet forming arms, each having box-like jet formers mounted to rotate at the surface layer of the liquid. The jet formers are bounded by upstanding, radially spaced vanes. The vanes are parallel and extend between upper and lower closure plates. The jet forming arms are circumferentially spaced providing for unobstructed entry of liquid from between and in front of the arms and for entry of air from above the aerator. The vanes form box-like structures which are inclined from a tangent to their path of motion so that their leading edges have a smaller radius of rotation than their trailing edges. The jet formers accelerate the surface layer of liquid into diverging, horizontal jet streams that embody entrained air bubbles. The jet streams travel onto the walls of the tank whereupon they are diverted downward and hence carry air down into the main body of the liquid. (Sinha-OEIS)  
W73-08304

**METHOD AND APPARATUS FOR ULTRASONICALLY CLARIFYING LIQUID,**  
FMC Corp., San Jose, Calif. (assignee).  
R. Davidson.

U. S. Patent No. 3,707,230, 4 p, 4 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 905, No 4, p 748, December 26, 1972.

Descriptors: \*Patents, \*Waste water treatment, \*Filtration, \*Ultrasonics, Equipment, Water quality control, Pollution abatement.

The effluent is passed through a rotating fabric in a chamber. Solids are deposited on the fabric that serves as a filter. Within the chamber, ultrasonic transducers set up vibrations to remove the solids from the filter. The solids are directed through a discharge pipe for removal. A pressure head is set up between the effluent and the clarified liquid, with the transducers located above the level of the clarified liquid. (Sinha-OEIS)  
W73-08306

**WASTE WATER CONCENTRATOR WITH PLURAL DISTRIBUTORS,**  
Swecc, Inc., Los Angeles, Calif. (assignee).  
W. J. Tally, Jr.

U. S. Patent No. 3,707,235, 9 p, 5 fig, 3 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 905, No 4, p 749, December 26, 1972.

Descriptors: \*Patents, \*Sewerage, \*Sewage treatment, \*Storm runoff, \*Storm drains, Water pollution sources, Water quality control, Equipment, Waste water treatment.

The apparatus for use in screening storm water overflows from sewer systems comprises a substantially cylindrical rotary screen disposed for rotation within a housing. A feed device is used to direct influent toward the inner surface of the screen. An outlet receives the effluent which passes through the screen, the concentrate which

does not pass the screen, and backsplash from the screen. (Sinha-OEIS)  
W73-08311

#### EXTENDED AERATION, ACTIVATED SLUDGE PLANT,

BIO2 Systems, Inc., Kansas City, Mo. (assignee).  
D. O. Smart, IV, G. B. Pennington, R. M. Plettner, and R. F. Maughan.  
U. S. Patent No. 3,709,363, 6 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 906, No 3, p 513, January 9, 1973.

Descriptors: \*Patents, \*Sewage treatment, \*Biological treatment, \*Activated sludge, \*Aerators, \*Waste water treatment, Water quality control, Water pollution control, Pollution abatement, \*Aerobic bacteria, Microorganisms, Treatment facilities.  
Identifiers: Clarifiers.

This plant utilizes many of the basic principles of the activated sludge process. In particular it is designed to efficiently convert organic wastes into oxidation end products which may be safely discharged to the environment. In addition to having an aerator and clarifier, it has a unique air lift arrangement which induces skimmer flow and sludge return flow from the clarifier to the aerator. The air which is employed for inducing recycle flow is ultimately discharged to the aerator for vigorously circulating the mixture and for supplying oxygen for the aerobic microorganisms. (Sinha-OEIS)  
W73-08317

#### METHOD AND APPARATUS FOR DENITRIFICATION OF TREATED SEWAGE,

Dravo Corp., Pittsburgh, Pa. (assignee).  
E. S. Savage.  
U. S. Patent No. 3,709,364, 4 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 906, No 2, p 513, January 9, 1973.

Descriptors: \*Patents, \*Activated sludge, \*Sewage treatment, \*Waste water treatment, \*Filtration, Bacteria, \*Denitrification, Carbon, Nitrates, Nitrites, \*Nutrient removal, Water quality control, Water pollution control, Pollution abatement.

Sewage is subjected to an activated sludge treatment and a highly nitrified effluent is discharged from the settling tank of the activated sludge system. The effluent is concurrently clarified and denitrified in a deep bed filter. Backwashing of the filter is controlled so that denitrifying bacteria is either wholly or partially maintained on the filter media or is immediately returned to the media enabling continuous operation of the filter. A supplemental carbon feed is charged to the filter to balance the bacteriological environment. (Sinha-OEIS)  
W73-08318

#### FLOATING SURFACE AERATOR,

Passavant-Werke, Michelbach (West Germany). Michelbacherhütte.  
H. Auler, and J. Muskat.  
U. S. Patent No. 3,709,470, 4 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 906, No 2, p 539, January 9, 1973.

Descriptors: \*Patents, \*Aerators, Equipment, \*Water pollution treatment, Pollution abatement, Water quality control, \*Aeration, \*Waste water treatment.

This aerating apparatus consists of radially extending blades or shovels which rotate about a vertical axis. The immersed buoyant body may be generally annular in shape. It surrounds the vertical axis. Small stabilizing floats located on the surface of the liquid are placed around the apparatus

and are connected with it. A baffle arrangement imparts a screw-shaped torque to the fluid passing through it in the direction opposite to the direction of rotation of the aerator. (Sinha-OEIS)  
W73-08319

#### METHOD AND APPARATUS FOR TREATING SEWAGE,

FMC Corp., San Jose, Calif. (assignee).  
Q. L. Hampton.  
U. S. Patent No. 3,709,792, 6 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 906, No 2, p 612-613, January 9, 1973.

Descriptors: \*Patents, \*Sewage treatment, Treatment facilities, \*Aerobic treatment, Biological treatment, \*Aeration, \*Activated sludge, \*Waste water treatment, Water quality control, Water pollution control, Biochemical oxygen demand.

Aqueous waste is mixed with aerated, concentrated sludge from a reaeration zone and a supernatant liquor from an aerobic sludge digestion zone to form a mixed liquor. Air is introduced into the aeration zone for mixed liquor, the aerobic digestion zone and the reaeration zone for sludge concentrate. Sludge is settled from the mixed liquor and is discharged into a flow course which delivers predetermined quantities of the sludge concentrate to the reaeration zone. Aerated sludge and supernatant liquor are discharged into the aeration zone. Control of the character of the sludge being recycled is an important factor in determining the overall efficiency of treatment of sewage as measured by removal of BOD. The apparatus comprises a tank which is compartmentalized by parallel partitions into a central compartment, a digestion compartment and a reaeration compartment. There is a common longitudinal axis for liquid flow. Conduits are provided in the setting compartment transverse to the longitudinal flow axis. These have airlift devices to induce movement of settled sludge. (Sinha-OEIS)  
W73-08320

#### DOMESTIC APPLICATIONS FOR AEROSPACE WASTE AND WATER MANAGEMENT TECHNOLOGIES,

General Electric Co., Schenectady, N.Y.  
For primary bibliographic entry see Field 07B.

W73-08366

#### REGIONALIZATION AND WATER QUALITY MANAGEMENT,

Camp, Dresser and McKee, Boston, Mass.  
K. M. Yao.  
Journal Water Pollution Control Federation, Vol 45, No 3, p 407-411, March, 1973. 2 fig, 2 tab, 9 ref.

Descriptors: Streams, \*Water quality, Management, \*Water pollution control, \*Massachusetts, \*Connecticut River, \*Simulation analysis, Dissolved oxygen, Water utilization, Water resources, Biochemical oxygen demand, Treatment facilities, Water supply, Computer programs, Low flow, Mathematical models, Systems analysis, \*Regional analysis.

Identifiers: Regionalization, Treatment plants, Streeter-Phelps equation, Bondi Island, Secondary treatment.

A study is presented which utilizes a realistic example and a simulation technique (a) to demonstrate the effects of regionalization on stream water quality management, and (b) to explore and compare various alternatives from the viewpoint of water quality management as well as that of overall water resources utilization. The study area comprises four municipalities in the Connecticut River basin which have been ordered by the Massachusetts state pollution control agency to upgrade their water pollution abatement facilities for achieving the state stream quality objective on a fixed time schedule. The Streeter-Phelps equation

was selected as the basis for the simulation model, and the stream DO used as the indicator of the extent of stream pollution and the attainment of the water quality objectives. The section of the river system studied was divided into six reaches; two sets of computer runs were made to calculate the minimum DO in each reach. Study results and discussions are presented in some detail. Regionalization can be a necessary step for cases involving small tributaries with a relatively large stem. (Bell-Cornell)  
W73-08383

**MODELLING REGIONAL WASTE WATER TREATMENT SYSTEMS,**  
Michigan Univ., Ann Arbor. School of Public Health.  
R. A. Deininger, and S. Y. Su.  
Water Research, Vol 7, No 4, p 633-646, April 1973. 7 fig, 1 tab, 14 ref.

Descriptors: \*Water pollution control, \*Waste Water Treatment, \*Costs, \*Optimization, \*Economics of scale, Planning, Treatment facilities, Algorithms, Mathematical models, Systems analysis, Operations research, Computer programs, Linear programming, \*Regional analysis.

How methods of operations research and systems analysis may be used to plan more efficient new water pollution control facilities or to upgrade existing systems is illustrated. The economies of scale in waste water treatment plants favor regional systems. Presented is a mathematical formulation of this problem and an algorithm for its solution. First, general cost data of the various parts of pollution control works are given; the cost of waste water treatment is composed of the amortization of the construction costs and the annual operation and maintenance costs. Next, several case examples which are network problems are presented. The mathematical formulation of the problems is then given, and an approach for solving the resulting minimization problem with concave objective functions is revealed. The large economies of scale in waste water treatment and conveyance indicate that regional solutions for pollution control may be more economical than individual solutions. Based on the computer code written in FORTRAN IV for an IBM 360/67, it appears that small to medium sized problems can be solved in reasonable time. The bottleneck for implementation of such regional plans will be the political and institutional arrangements. (Bell-Cornell)  
W73-08385

**SIMPLE ALGORITHM FOR COST OPTIMIZATION OF A THREE DECISION VARIABLE SYSTEM,**  
Wayne State Univ., Detroit, Mich. Dept. of Civil Engineering.  
C. J. Ordon.  
Water and Sewage Works, Vol 120, No 2, p 70-73, February, 1973. 1 fig, 1 tab.

Descriptors: Environmental engineering, \*Treatment facilities, \*Design, \*Waste water treatment, \*Costs, \*Optimization, \*Algorithms, \*Trickling filters, Decision making, Computers, Equations, Mathematical models, Operations research, Constraints, Tertiary treatment.  
Identifiers: Tree diagrams, Eckenfelder equation.

Good engineering design implies fulfilling a stated set of objectives at the least possible cost. Cost optimization of simple one or two stage systems is inherent in design techniques normally utilized in all engineering design. However, the design of three or more stage systems is most usually based upon judgment of the engineer. Presented is a simple, workable algorithm, easily understood and put into practice, which can be solved readily by hand or by computer and which can be used in the solution of a wide variety of engineering problems. To

illustrate the use of the algorithm, a three-stage waste water treatment plant is optimized. To insure meaningful results, it is necessary to include costs for each stage versus the percent removal for that stage. A simple tree diagram is used to illustrate the process. To exemplify the versatility of the algorithm, it is used to show the optimization of a trickling filter using the Eckenfelder equation. The algorithm has many possible applications both within and outside the realm of environmental engineering, and it can be applied to more than three variable systems. (Bell-Cornell)  
W73-08386

**FLOCCULATING APPARATUS AND METHOD,**  
Crucible Inc., Pittsburgh, Pa. (assignee)  
G. C. Almasi, and W. Shuarczyk.  
U. S. Patent No 3,714,037, 3 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 906, No 5, p 1722, January 30, 1973.

Descriptors: \*Patents, \*Flocculation, \*Waste water treatment, \*Industrial wastes, \*Filtration, Water quality control, Water pollution control, Separation techniques, Pollution abatement.  
Identifiers: \*Magnetic particles, \*Magnetization.

Magnetic particles are removed from industrial waste water by magnetizing the particles during flow. The particle containing liquid is introduced into a restricted passage having a large width to height ratio without any change in cross-sectional area. The passage has a magnetic field. Its lines of force are at right angles to the lengthwise liquid flow direction. As the particles are magnetized they agglomerate so that they may be removed by a filter or by settling in a tank. (Sinha-OEIS)  
W73-08388

**SYSTEMS FOR THE REMOVAL OF POLLUTANTS FROM WATER,**  
A. J. Shaler, and D. C. McLean.  
U. S. Patent No 3,713,542, 9 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 906, No 5, p 1606, January 30, 1973.

Descriptors: \*Patents, \*Activated carbon, \*Sewage treatment, \*Organic wastes, \*Water treatment, Pollution abatement, Water quality control, Water pollution control, Treatment facilities, \*Waste water treatment.

This method consists of providing an extensive wall of char or activated carbon, down the height of which the mixture of sewage effluent and unclean water is allowed to flow by gravity. The carbon is continuously regenerated by cycling through a thermal converter. Organically polluted sewage effluent and water from the waterway are continuously mixed and piped to the top of the wall of carbon, passed through it, and the clean water is drained from the bottom. The flow through the system may be reversed to backwash the screens and temporarily partially fluidize the carbon wall to prevent long-term decreases in its permeability. (Sinha-OEIS)  
W73-08389

**APPARATUS FOR PROCESSING EFFLUENT SLUDGE,**  
Hazemag G.m.b.H., Muenster (West Germany).  
E. von Conrad, K. Rosner, and L. Meyer.  
U. S. Patent No 3,712,550, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 906, No 4, p 1334, January 23, 1972.

Descriptors: \*Patents, \*Sludge treatment, Equipment, Separation techniques, \*Waste treatment, Water quality control, Water pollution control, Pollution abatement, \*Waste water treatment.  
Identifiers: \*Impact grinders.

The apparatus consists of an impact grinder for converting solid refuse to a particulate stage. The

grinder comprises a rotor journaled for rotation about a horizontal axis. There is a supply conduit extending along and above an outlet. A distribution baffle extends along a slot and is inclined downward so that effluent sludge flows in the form of a thin layer over the baffle and onto the ground refuse issuing from the outlet. (Sinha-OEIS)  
W73-08390

**REVERSE OSMOSIS MODULE,**  
Westinghouse Electric Corp., Pittsburgh, Pa. (assignee)  
G. W. Ellenburg.  
U. S. Patent No 3,712,473, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 906, No 4, p 1314, January 23, 1973.

Descriptors: \*Patents, \*Reverse osmosis, \*Semipermeable membranes, \*Desalination, Water treatment, \*Demineralization, Membranes, Water quality control, \*Waste water treatment, Water pollution control, Pollution abatement, Separation techniques, \*Dissolved solids.

A reverse osmosis module is described for reducing the concentration of dissolved solids in a pressurized liquid by passing the liquid through a semipermeable osmotic membrane. The module is formed from a porous sand bar in which tubular osmotic membranes are placed in longitudinal holes. An enveloping membrane embraces the outer peripheral surface of the bar. The ends of the bar are sealed with epoxy. Only compressive forces are required. (Sinha-OEIS)  
W73-08391

**PROCESS FOR THE TREATMENT OF PHENOLATED INDUSTRIAL EFFLUENT,**  
Societe Anonyme pour l'Etude et l'Exploitation des Procedes Georges Claude, Pairs (France). (assignee)  
J.-P. Zumbrunn, and F. Crommelynck.

U. S. Patent No 3,711,402, 5 p, 3 ref; Official Gazette of the United States Patent Office, Vol 906, No 3, p 1029, January 16, 1973.

Descriptors: \*Patents, \*Chemical reactions, \*Waste water treatment, Chemical wastes, \*Liquid wastes, \*Phenols, \*Industrial wastes, Pollution abatement, Water quality control, Water pollution control.

Industrial effluent polluted by phenolated impurities is treated by conversion of the impurities by the action of an oxidizing reagent containing the  $\text{HSO}_5^-$  anion. At least one mole of  $\text{HSO}_5^-$  is required per mole of phenol. The oxidizing reagent is a member of the group constituted by monopersulfuric acid and its salts. Eleven examples illustrate possible variations. (Sinha-OEIS)  
W73-08394

**METHOD OF PURIFYING SEWAGE AND WASTE LIQUIDS AND A DECOCTING SYSTEM FOR CARRYING OUT THE METHOD,**  
G. E. Lagstrom.  
U. S. Patent No 3,711,381, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 906, No 3, p 1025, January 16, 1973.

Descriptors: \*Patents, \*Sewage treatment, \*Liquid wastes, \*Domestic wastes, \*Detergents, \*Waste water treatment, Chemical wastes, Water quality control, Water pollution control, Pollution abatement.

Sewage and/or domestic effluent is boiled to produce a foam of the impurities. The steam and foam are removed and separated. The foam is led into a sedimentation tank and the steam either released to the atmosphere or used as a heat source. The sludge obtained in the sedimentation tank as the foam breaks down is removed at intervals and fed back to the boiler. (Sinha-OEIS)

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5D—Waste Treatment Processes

W73-08395

#### METHOD AND APPARATUS FOR TREATING SEWAGE, FMC Corp., Chicago, Ill. (assignee)

H. Brociner.

U. S. Patent No 3,710,941, 4 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 90, No 3, p 921, January 16, 1973.

Descriptors: \*Patents, Pollution abatement, \*Waste water treatment, \*Sewage treatment, Treatment facilities, \*Aeration, Water quality control, Water pollution control, \*Liquid wastes. Identifiers: \*Grit.

Grit is removed from liquid sewage in a tank whose floor terminates in an accumulation zone for solids. Air is introduced into the sewage adjacent to the first side wall and above the accumulation zone for solids with uniform distribution along the length of the side wall. A baffle is positioned adjacent to a second side wall and transverse to the direction of liquid flow through the tank. This advances the separation of light weight solids. The sewage suspension flows under the baffle and upward for removal by flow over a weir. (Sinha-OEIS)  
W73-08396

#### SODIUM ALUMINATE FOR REMOVAL OF PHOSPHATE AND BOD, Babbitt Utilities Commission, Minn.

D. Cole, and P. Tveite.

Public Works, Vol 103, No 10, p 86-87, October, 1972. 1 fig, 1 tab.

Descriptors: \*Phosphates, \*Biochemical oxygen demand, Domestic wastes, \*Waste water treatment, Coliforms, Chlorination, Suspended solids, \*Chemical precipitation.

Identifiers: \*Sodium aluminate, \*Chemical treatment.

In a three month trial at the Babbitt activated sludge treatment plant, 42.5% sodium aluminate was fed to sewage influent to evaluate the chemical for phosphate removal. Sodium aluminate reacts with soluble phosphate to form aluminum phosphate. Sodium aluminate also acts as a coagulant and flocculant, causing both the precipitated aluminum phosphate and other insoluble phosphates in the waste to agglomerate and separate readily in the clarifier or settling tank. Among other benefits of the sodium aluminate treatment were: (1) lower effluent BOD; (2) lower chlorine demand; (3) lower effluent coliforms; (4) reduced air requirements in the aeration chambers; (5) higher effluent dissolved oxygen; and (6) improved primary sludge characteristics. Quantitative results are presented. Babbitt has decided to use the aluminate treatment, and the chemical storage facilities are currently being designed. (Morparia-Texas)  
W73-08410

#### UHDE DETAILS CHLORINE CELL MERCURY RECOVERY PROCESSES.

European Chemical News, Vol 22, No 544, p 22, August 4, 1972.

Descriptors: \*Mercury, \*Filtration, \*Chlorine, Carbon, Chemical reactions, Absorption, \*Waste water treatment, Industrial wastes.

Identifiers: Hydrazine sulfide, \*Chemical treatment, Caustic soda solution.

Mercury losses from chlorine plants are discussed. Mercury levels which can be obtained through use of new techniques are described. The caustic soda solution can be pre-coat filtered to a mercury content of 0.1 to 0.3 g/m<sup>3</sup>. Mercury leaving the decomposer can be removed by condensation. Chemical reaction with wet chlorine, or absorption on car-

bon. Bayer catalyst in place of activated carbon will reduce the mercury content in the hydrogen jar to below 1 microgram/Nm<sup>3</sup>. Waste water from scrubbing operations can be treated with hydrazine or sulfide. Ventilation air is kept pure by using totally enclosed cells. Handling procedures minimize mercury-air contact time. The resulting mercury loss is 2 to 3 grams per ton of chlorine produced. (Anderson-Texas)  
W73-08411

#### FERMENTATION PATTERNS IN THE INITIAL STAGES OF SEWAGE SLUDGE DIGESTION, Purdue Univ., Lafayette, Ind.

R. M. Sykes, and E. J. Kirach.

Developments in Industrial Microbiology, Vol 11, p 357-366, 1969. 5 fig, 1 tab, 16 ref.

Descriptors: \*Sludge digestion, \*Waste water treatment, Sludge, Activated sludge, \*Fermentation, \*Sewage treatment, Hydrogen, Carbon dioxide, Amino acids, Humic acids.

Identifiers: Methane, Propionic acids, Butyric acids, \*Acetic acid.

The physiological activity of 75 pure culture isolates grown in sterilized raw sewage sludge was compared with that of a mixed culture obtained from a sludge digester. Some of the fermentation products formed were identified and quantitated. In the mixed culture a biphasic pattern of gas and acid production was apparent. During the early stages, acetic, propionic, and butyric acids were produced in nearly equal quantities, while hydrogen and carbon dioxide were evolved in nearly equal quantities. After 3 days, only acetic acid was produced in quantity, hydrogen disappeared, methane was evolved, and carbon dioxide continued to accumulate. Of the pure culture isolates, 25 percent produced acetic, propionic, and butyric acids, hydrogen and carbon dioxide. The remainder produced only acetic acid, propionic acid, and carbon dioxide. None of the pure isolates produced methane. (Morparia-Texas)  
W73-08412

#### BUDDS FARM SEWAGE-TREATMENT WORKS OF HAVANT AND WATERLOO URBAN DISTRICT COUNCIL.

Water Pollution Control, Vol 71, No 4, p 348-350, 1972.

Descriptors: \*Waste water treatment, \*Treatment facilities, Biological treatment, Settling basins, \*Sludge digestion, Sludge, Storage capacity, Capital costs, \*Sewage treatment.

The sewage-treatment plant capacity was extended to 145,000 population in 1969. The new units include comminutors, detritor, sedimentation tanks, biological filters with slag medium, and a new ocean outfall. Additional capacity for sludge digestion, storage, and pressing was provided. The standards set by the Hampshire River Authority are 30 mg/1 SS and 20 mg/1 BOD for flows up to 18 mgd and screening for overflows. A table of construction costs is included. (Anderson-Texas)  
W73-08414

#### THE DISPOSAL OF SOLID WASTES, For primary bibliographic entry see Field 05E. W73-08415

#### FILTER PLANT WASTEWATER TREATMENT, Pirnie (Malcolm), Inc., Paramus, N.J.

G. P. Westerhoff.

Public Works, Vol 103, No 10, p 79-82, October, 1972. 2 fig.

Descriptors: \*Waste water treatment, \*Treatment facilities, \*Waste disposal, \*Tertiary treatment, \*Filtration, Sedimentation, \*Coagulation, Alum,

Chlorination, Flocculation, Settling basins, Separation techniques, Data collections, Waste water (Pollution).

Water treatment plant wastewater disposal is discussed. There are two main sources of wastewater: coagulation basin wastewater (referred to as alum sludge at plants using alum coagulation); and filter backwash wastewater. Water treatment processes used at the Erie County Sturgeon Point Filtration Plant are aeration, chemical addition, mixing, flocculation and sedimentation followed by filtration, pH adjustment, fluoridation and chlorination. Alum recovery from coagulation basin wastewater was proved to hold considerable promise as an effective system for treatment recovery, and disposal of process residue. A study program has been designed to carry out data collection and evaluation to meet various goals such as identifying the physical and chemical properties of water treatment plant wastes and the effectiveness of several methods of liquid-solid separation (both with and without the addition of coagulation aids). The data will reflect overall plant operation and efficiency and the feasibility of each process. Both phases of this study program are described. (Morparia-Texas)  
W73-08416

## 5E. Ultimate Disposal of Wastes

#### INDUSTRIAL WASTELINE STUDY - A SYSTEM FOR CONTROLLED OCEAN DISPOSAL, Franklin Inst., Philadelphia, Pa. Labs. for Research and Development.

D. Pindzola, C. T. Davey, and R. A. Erb.

Available from the National Technical Information Service as PB-219 404, \$3.00 in paper copy, \$1.45 in microfiche. Final Technical Report F-C2577, (1970). 77 p, 12 fig, 23 tab, 33 ref, 2 append. EPA Grant 16070 EOI 7/70.

Descriptors: \*Waste disposal, \*Pipelines, Baseline studies, Continental shelf, Continental slope, Ultimate disposal, \*Outlets, Industrial wastes, Sewage sludge, Water pollution sources, Atlantic Ocean. Identifiers: \*Ocean outfalls, \*Ultimate waste disposal, Dredge spoils.

Pipelining waste to the edge of the continental shelf from the Delaware Valley was found to be feasible by defining waste loads, routes, pipe types, conditions of the proposed outfall area and costs. The waste load was examined and projected by type and quantity by percent of total volume as follows: dredge spoils, 24%; sewage sludges, 6%; waste acids and chemicals, 6%; ashes, 0.3%; and dilute industrial waste, 63.7%. Present dilute volume is established at 5,840 million gallons per year. Routes may generally be obtained along power and rail lines currently existing. Of pipe materials considered, polyester-glass reinforced pipe appears best for overland routing and polyolefin for undersea. Estimated installation costs are in the area of \$75,000,000. Disposal costs could be reduced from the current \$3.50 to \$1.85 per 1000 gallons. Ocean studies included otter trawls and direct observation by submersible which showed the biodiversity to fall off with increasing depth. The proposed disposal area appears less densely populated than inshore areas and less productive than bays, marshes and estuaries where wastes are currently deposited. Bottom currents were determined to be mainly off shore by current meters and seabed drifters. Of 400 seabed drifters deposited, only two were recovered, these by commercial trawlers. Dissolved oxygen levels were high in the water column. Further examination and baseline data are needed. Actual pilot construction would be desirable. (EPA)  
W73-07812

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Ultimate Disposal of Wastes—Group 5E

#### SLUDGE FILTER PRESSING AND INCINERATION AT SHEFFIELD, Sheffield Corp., Wincobank (England).

H. B. Tench.  
Water Research, Vol 6, p 539-544, 1972. 2 fig, 2 tab.

Descriptors: \*Sludge treatment, \*Sludge disposal, \*Waste disposal, \*Incineration, \*Automation, Sludge, Cost analysis, Treatment facilities, Polyelectrolytes, Filters.  
Identifiers: \*Filter pressing, \*Operating techniques.

Sludge from the Blackburn Meadows works is settled, conditioned with lime, pressed by one of thirty-six filter presses and transported by rail car to an incinerator. Various operating techniques were tried to improve performance including polyelectrolyte conditioning and automatic control of sludge conditioning. Experiments are being performed with a view to automatic control of incineration in order to reduce fuel costs. (Anderson-Texas)  
W73-07842

#### RADIOACTIVE WASTES (DIE RADIOAKTIVEN ABFAELLE),

Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). K. Kuehn.  
Neue Technik, Vol 13, p 61-68, 1971. 3 fig, 2 tab, 18 ref.

Descriptors: \*Nuclear wastes, \*Underground, \*Waste disposal, \*Radioactivity, Food chains, Radioactivity effects, Nuclear powerplants, Effluents, Path of pollutants, Cements, Bituminous materials, Leaching, Geologic formations, Groundwater barriers, Neutron adsorption, Trace elements, Waste treatment, Water pollution sources, Ultimate disposal, Waste storage, Tritium, Radioisotopes, Reviews.

Although tritium and Kr-85 may be dispersed in the atmosphere for as long as 100 years with little effect, certain other of the radionuclides from fission and from neutron absorption by trace elements in nuclear-powerplant cooling water must be isolated from man's environment. Current practice has decreased radioisotopes in gaseous and liquid effluents to very low levels. Storage of radioactive liquids in tanks is less suitable in the long term than storage of solidified wastes in rock salt or other geologic formations. Storage by sinking into the oceans or by burial is used for relatively small quantities. Some research is mentioned. (Bopp-ORNL)  
W73-07934

#### RADIOACTIVE-WASTE MANAGEMENT,

Cambridge Nuclear Corp., Billerica, Mass.  
For primary bibliographic entry see Field 05G.  
W73-07954

#### DISPOSAL OF RADIOACTIVE WASTES ARISING IN THE UNITED KINGDOM FROM THE PEACEFUL USES OF ATOMIC ENERGY,

National Radiological Protection Board, Harwell (England).

P. M. Bryant, and F. Morley.  
Available from NTIS, Springfield, Va., as NRPB-R1, \$3.00 paper copy \$1.45 microfiche. Report No. NRPB-R1, April 1971. 16 p, 8 tab, 25 ref.

Descriptors: \*Nuclear powerplants, \*Radioactive waste disposal, \*Effluents, \*Air pollution, \*Water pollution, \*Water pollution sources, Atlantic Ocean, Rivers, Environment, Monitoring, Assay, Path of pollutants, Food chains, Marine fish, Public health, Legislation, Regulation.  
Identifiers: Thames River, English Channel, Irish Sea.

United Kingdom policy in relation to radioactive waste is described and the relevant legislation and methods of control are summarized. Data are given on the amounts of radioactivity discharged as waste from establishments of the United Kingdom Atomic Energy Authority, the nuclear power stations operated by the Electricity Generating Boards and other users of radioactive materials. Studies of the behavior of radioactivity in the environment are reported with particular reference to food chains and other potential sources of irradiation of the public. The results of environmental monitoring are presented and estimates are made of radiation doses received by individual members of the public and larger population groups as a result of waste disposal. It is concluded that the doses received are all within the appropriate limits recommended by the International Commission on Radiological Protection. (Houser-ORNL)  
W73-07957

#### POLLUTION OF SUBSURFACE WATER BY SANITARY LANDFILLS, VOLUME 1,

Drexel Univ., Philadelphia, Pa.

For primary bibliographic entry see Field 05B.  
W73-08073

#### USE OF WASTE TREATMENT PLANT SOLIDS FOR MINED LAND RECLAMATION,

Illinois Univ., Urbana.  
T. D. Hinesley, R. L. Jones, and B. Sosewitz.  
Mining Congress Journal, Vol 58, No 9, p 66-73, September, 1972. 2 fig, 1 tab, 21 ref.

Descriptors: \*Sludge disposal, \*Waste disposal, Ultimate disposal, \*Land reclamation, Land development, Land resources, Land use, Strip mines, Cost analysis, \*Waste treatment, Recycling, Soils, \*Illinois.  
Identifiers: Fulton County (Ill), \*Stripped mine land reclamation.

It is apparent that the most desirable solution to the problem of sludge disposal is the recycling of the solids to natural biological systems. Fulton County, Illinois, is cited as an example of an area where waste treatment plant solids will be used for land reclamation because of the extensive stripped mine lands. An extensive geologic, biologic, and agricultural overview is presented of the effects expected due to this sludge disposal process. A cost analysis of the entire project is included. (Smith-Texas)  
W73-08096

#### 'LIQUID FERTILIZER' TO RECLAIM LAND AND PRODUCE CORPS,

Metropolitan Sanitary District of Greater Chicago, Ill.

B. T. Lynam, B. Sosewitz, and T. D. Hinesley.

Water Research, Vol 6, p 545-549, 1972. 3 tab, 9 ref.

Descriptors: \*Sludge disposal, \*Land reclamation, \*Waste disposal, Nitrogen, Phosphorus, Organic matter, Soils, Soil contamination, Viruses, Fecal coliforms, Agriculture, Fertilizers, \*Illinois, Water reuse.  
Identifiers: \*Chicago, \*Nutrient sources.

The Metropolitan Sanitary District of Greater Chicago handles a waste load equivalent of 10 million people. Disposal methods to handle the vast amount of sludge were studied. Land application of liquid sludge was determined to be the cheapest as well as most effective method. Studies by agronomists have shown the value of liquid sludge as a nitrogen source, phosphorus source, organic matter source, and as a soil conditioner. Microbiological studies indicate a rapid die-off rate for virus and fecal coliform. The heavy metal content is small and not expected to cause soil contamination. (Anderson-Texas)  
W73-08098

#### WALDHOF TYPE OF FERMENTORS IN DISPOSAL OF FOOD WASTES,

Iowa State Univ., Ames.  
For primary bibliographic entry see Field 05D.  
W73-08120

#### EUROPEAN METHODS OF COMPOSTING AND SLUDGE UTILIZATION,

L. D. Hills.  
Compost Science, p 18-19, July-August, 1972.

Descriptors: \*Waste treatment, \*Land reclamation, \*Fertilizers, \*Sludge disposal, Ultimate disposal, Waste disposal, Urine, Domestic wastes, Sludge treatment, Organic matter.  
Identifiers: \*Composting, Clivus toilet.

Methods of composting and sludge utilization in Europe are described. While sludge is primarily used as fertilizer and for land reclamation, composting is done by means of the Clivus Toilet. This is roughly a family Municipal compost plant that takes the excreta and urine and composts them with the kitchen wastes to produce roughly a hundred pounds a year, from a family of three, of a good high potash organic fertilizer. (Smith-Texas)  
W73-08123

#### DISPOSAL OF BRINE EFFLUENTS,

Dow Chemical Co., Walnut Creek, Calif.

R. R. Grinstead, and T. E. Lingafelter.  
Available from the National Technical Information Service as PB-215 037, \$3.00 in paper copy, \$1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 810, August 1972. 120 p, 18 tab, 33 fig, 23 ref, 5 append.

Descriptors: By-products, Solvent extraction, Separation techniques, \*Brine disposal, Liquid wastes, \*Waste disposal, \*Desalination, Salts, Effluents, \*Chemical precipitation, \*Anion exchange, \*Water softening, Recycling, Chlorides, Sulfates.  
Identifiers: Metal complexation.

A process is described by which brines from the desalination of brackish water supplies can be converted to either useful products or waste materials which can be readily disposed of without environmental harm. The method involves (1) precipitation of the sulfate with calcium chloride, (2) exchange of chloride for bicarbonate by means of a liquid-liquid anion exchange extraction system, and (3) recycle of the bicarbonate solution to the pretreatment (softening) step. The extraction system is regenerated with lime and carbon dioxide, producing calcium chloride as a product, some of which is used in step (1). In cases where the sodium bicarbonate production is greater than required in pretreatment, a second liquid-liquid extraction system, based on a carboxylic acid cation exchanger, is used to produce sodium carbonate for sale. Preliminary economic estimates indicate that such a process would become competitive with conventional disposal methods (solar ponds or wells) at a production level slightly above 5 mgd of water and would be most attractive in cases where a high sodium carbonate requirement exists for pretreatment. (OSW)  
W73-08189

#### MARINE WASTE DISPOSAL - A COMPREHENSIVE ENVIRONMENTAL APPROACH TO PLANNING,

For primary bibliographic entry see Field 05B.  
W73-08247

#### THE DISPOSAL OF CATTLE FEEDLOT WASTES BY PYROLYSIS,

Midwest Research Inst., Kansas City, Mo.  
For primary bibliographic entry see Field 05D.  
W73-08290

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5E—Ultimate Disposal of Wastes

#### THE DISPOSAL OF SOLID WASTES,

A. R. Balden.

Industrial Water Engineering, Vol 4, No 8, p 25-27, August, 1967. 6 fig, 2 ref.

Descriptors: \*Ultimate disposal, \*Industrial wastes, \*Waste treatment, Sludge, Sludge disposal, \*Incineration, Design, Paints, Chemical wastes, Pilot plants, Tertiary treatment. Identifiers: \*Paint wastes.

Methods of ultimate disposal and their application in handling oily sludges and paint wastes in the automotive industry are reviewed. Five methods from the Environmental Health Series, "Summary Report, Advanced Waste Treatment Research" are briefly explained. Three variations in incinerator design are described. Each design is capable of burning oily sludges without objectionable emissions. A pit incinerator for treatment of paint sludges, operated by a chemical manufacturer, is described. (Morparia-Texas)  
W73-08415

### 5F. Water Treatment and Quality Alteration

#### DEVELOPMENT OF MULTIPURPOSE WATER PURIFICATION UNIT FOR ARMY FIELD USE.

Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

A. Ford, Jr., and D. C. Lindsten.

Available from the National Technical Information Service as AD750 322, \$3.00 in paper copy, \$1.45 in microfiche. 1972. 15 p, 9 fig, 5 tab, 3 ref.

Descriptors: \*Water treatment, \*Potable water, \*Water supply, \*Reverse osmosis, \*Membranes, Suspended solids, Chemicals, Botulism, Water quality control, Water pollution treatment, Filtration, Cellulose, Turbidity, Salts, Bacteria, Water purification. Identifiers: \*Ultrafiltration.

The Army Combat Developments Command has established a requirement for research and development to demonstrate the technical feasibility of a single multipurpose unit capable of producing potable drinking water for culinary, washing, bathing, laundering, and food preparation purposes. Reverse osmosis is capable of removing up to 99% of dissolved salts from water, removing essentially all turbidity from water, removing 99% of chemical agents VX and RZ, 78% of chemical agent GB, 98% of Na2HASO4 and 99.988% of botulinum toxin from water. Furthermore, reverse osmosis is capable of removing essentially all microorganisms from water although chlorination is indicated to protect the product water. The one disadvantage appears to be membrane fouling, which may be solved by feedwater pretreatment, intermittent cleaning or modular replacement. (Smith-Texas)  
W73-07833

#### DESALINIZATION PLANTS, VIRGIN ISLANDS (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Department of Housing and Urban Development, San Juan, Puerto Rico. Region II.

For primary bibliographic entry see Field 03A.

W73-07977

#### STATE OF THE ART OF WATER FILTRATION,

American Water Works Association, New York.

Committee on Filtration Problems.

R. L. Woodward, E. R. Baumann, J. A. Borchardt, N. J. Davoust, and K. A. Dostal.

Journal of the American Water Works Association, Vol 64, No 10, p 662-665, October 1972. 26 ref.

Descriptors: \*Filtration, \*Filters, \*Water treatment, \*Water quality control, \*Waste water treatment, Water pollution control, Design criteria, Turbidity, \*Tertiary treatment, Treatment facilities, Separation techniques.

Identifiers: \*Plant operations, Upflow rates, Filtration rates.

Rapid filtration of water is discussed under two main topics: (1) theory of filtration and (2) design and operation of water filters. In the design and operation of filters, consideration is made of filter media, filter aids, filter rates, upflow and byflow filters, turbidity meters, surges and backwashing. Careful collection analysis and reporting of plant operating experience where advanced design or operating features exist is encouraged. (Smith-Texas)  
W73-08107

#### PHILADELPHIA SUBURBAN WATER COMPANY,

Philadelphia Suburban Water Co., Bryn Mawr, Pa. K. E. Shull.

Journal of the American Water Works Association, Vol 64, No 10, p 647-648, October 1972. 1 fig, 6 ref.

Descriptors: \*Water treatment, \*Waste water treatment, Research and development, Aluminum, Filtration, Filters, Polyelectrolytes, Anions, Ions, Laboratory tests, Pilot plants, Sludge treatment, Corrosion, \*Pennsylvania.

Identifiers: \*Philadelphia.

Details are given of various research projects being conducted by the Philadelphia Suburban Water Company. These projects include development of a method for determining small amounts of aluminum in water; use of dual media filters, and polyelectrolyte application; development of a filtrate availability technique; investigations of polyelectrolytes; investigation of the use of cationic, anionic, and non-ionic polyelectrolytes as filter aids; sludge conditioning studies, and laboratory and pilot studies of the use of certain compounds in reducing the corrosive tendencies of water on metal pipes. (Smith-Texas)  
W73-08109

#### DETROIT METRO WATER DEPARTMENT,

Detroit Metro Water Dept., Mich.

G. J. Remus.

Journal of the American Water Works Association, Vol 64, No 10, p 644-645, October 1972.

Descriptors: \*Water reuse, \*Recycling, Flocculation, Waste water treatment, Water treatment, Corrosion, Corrosion control, Bioassays, Turbidity, Ions, Water pollution control, Water quality control, Michigan.

Identifiers: \*Detroit.

Several research programs conducted by the Detroit Metro Water Department are detailed. They include studies of recycling of waste wash water; flocculator tests; dual media tests; studies with polyelectrolytes; fluoride corrosion tests; corrosion studies of copper surfaces; plankton counting and identification reproducibility; bioassay studies; liquid alum feeding; tests of turbidity; study of water samples; and specific ion electrodes. (Smith-Texas)  
W73-08110

#### DALLAS WATER UTILITIES,

Dallas Water Utilities Dept., Tex.

H. J. Graeser.

Journal of the American Water Works Association, Vol 64, No 10, p 638-641, October 1972. 1 fig, 5 tab, 1 ref.

Descriptors: \*Waste water treatment, \*Waste treatment, \*Sewers, \*Combined sewers.

\*Polymers, \*Pilot plants, Research and development, Operating costs, Waste disposal, Sewage disposal, Pollution abatement, Water reuse, Treatment facilities, Research facilities, \*Texas, Water supply.

Identifiers: Dallas.

The Dallas Water Utilities Department has been able to develop a unified approach to solving problems in water supply and waste water disposal. The City of Dallas has constructed a pilot plant to evaluate different unit processes. Operation of this pilot plant has been costly, but the savings realized in process selection and the operational experience gained prior to start-up to the prototype do much to offset the research cost. The City of Dallas has also been experimenting with developing technological factors of waste water reuse. The two major areas of research are metal and virus removal. Other areas of research now being conducted by the City of Dallas include microbiological studies, studies of the treatment and disposal of infiltration flows in the sanitary sewer system, and experimentation with the use of sewers to increase the hydraulic capacity of sewers. (Smith-Texas)  
W73-08111

#### WATER AND SEWER PLAN.

West Alabama Planning and Development Council, Tuscaloosa.

For primary bibliographic entry see Field 06D.

W73-08181

#### INVENTORY OF INTERSTATE CARRIER WATER SUPPLY SYSTEMS.

Environmental Protection Agency, Washington, D.C. Water Supply Div.

January 1973. 81 p.

Descriptors: \*Water supply, \*Environmental sanitation, \*Potable water, \*Public health, \*Water purification, Interstate, Water resources development, Water utilization, Water yield improvement, Resources development, Water supply development, Municipal water, Water quality control, Water quality standards.

In 1970 the Environmental Protection Agency was assigned the responsibility of certifying water supply systems serving interstate carriers, a project formerly accomplished by the Public Health Service. Interstate quarantine regulations were promulgated to control the transmission of communicable disease into the U.S. or between the states; additionally, they contain the standards for acceptable, safe drinking water systems and form the basis for the interstate carrier water supply certification program. Systems in substantial compliance with the standards are classified as approved; those with significant deviations from the quality, surveillance, facilities or operational requirements of the standards are prohibited. Charts and graphs provide all necessary information. The status of all water systems are listed by regional EPA offices as of December 29, 1972. (Mockler-Florida)  
W73-08192

#### A PORTABLE VIRUS CONCENTRATOR FOR TESTING WATER IN THE FIELD,

Baylor Coll. of Medicine, Houston, Tex. Dept. of

Virology and Epidemiology.

For primary bibliographic entry see Field 05A.

W73-08262

#### REGIONALIZATION AND WATER QUALITY MANAGEMENT,

Camp, Dresser and McKee, Boston, Mass.

For primary bibliographic entry see Field 05D.

W73-08383

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Water Quality Control—Group 5G

**CHEMICAL ANALYSES OF SELECTED PUBLIC DRINKING WATER SUPPLIES (INCLUDING TRACE METALS),**  
Wisconsin Dept. of Natural Resources, Madison.  
For primary bibliographic entry see Field 05A.  
W73-08424

**RECURRENT ST. LOUIS ENCEPHALITIS INFECTION IN RESIDENTS OF A FLOOD PLAIN OF THE TRINITY RIVER, ROOSEVELT HEIGHTS (DALLAS, TEXAS),**  
Texas Univ., Dallas. Southwestern Medical School.  
For primary bibliographic entry see Field 05C.  
W73-08448

### 5G. Water Quality Control

**A MANUAL ON COLLECTION OF HYDROLOGIC DATA FOR URBAN DRAINAGE DESIGN,**  
Hydrocomp, Inc., Palo Alto, Calif.  
For primary bibliographic entry see Field 07C.  
W73-07801

**ECONOMIC EVALUATION OF ALTERNATIVE FARM WATER SOURCES IN THE CLAYPAN AREA OF ILLINOIS,**  
Illinois Univ., Urbana. Dept. of Agricultural Economics.

C. L. Moore, E. R. Swanson, and W. D. Seitz.  
Available from the National Technical Information Service as PB-219 239, \$3.00 in paper copy, \$1.45 in microfiche. Illinois Water Resources Center Research Report No. 62, 1973. 85 p., 8 fig., 16 tab, 33 ref, append. OWRR A-054-ILL (2). 14-31-0001-3513.

Descriptors: \*Cost analysis, Farm ponds, Water quality, \*Illinois, Water supply, Potable water, Water supply development.  
Identifiers: \*Farm water supply, \*Rural water systems, Farm wells, \*Claypan area (Ill.).

The claypan area of Illinois is characterized by unreliable water supplies. In addition, water quality problems have recently been recognized in the form of widespread nitrate and coliform contamination of water in private wells in Washington County. A ten-square mile area in this county was selected for study. The nature of present water supplies was described and the costs of six alternative supply systems were estimated: (1) present on-farm sources, (2) treatment of pond water, (3) combination of present on-farm sources plus hauling, (4) hauling all water, (5) purchasing all water from nearby municipality via pipeline, and (6) combination pipeline plus present on-farm sources. The six alternatives were examined in terms of the net present value of costs associated with each alternative, considering a 40-year planning period. Although the present sources proved to be the least costly they are unsatisfactory for reasons of health and also reliability. Treatment of pond water was the least-cost source of meeting the quality requirements for water for the total area. However, the reliability of this source and questions of personal preference against drinking pond water may indicate preference among some users for connection with a municipal system which was somewhat more expensive.  
W73-07804

**A METHODOLOGY FOR PLANNING OPTIMAL REGIONAL WASTEWATER MANAGEMENT SYSTEMS,**  
Massachusetts Univ., Amherst. Water Resources Research Center.  
For primary bibliographic entry see Field 05D.  
W73-07805

**REAERATION OF WATER WITH TURBINE DRAFT-TUBE ASPIRATORS,**  
Missouri Univ., Columbia. Dept. of Civil Engineering.  
J. J. Cassidy.

Available from the National Technical Information Service as PB-219 263, \$3.00 in paper copy, \$1.45 in microfiche. Missouri Water Resources Research Center Completion Report, January 5, 1973. 22 p., 8 fig., 32 ref. OWRR A-044-MO (1). 14-31-0001-3525.

Descriptors: \*Water quality control, \*Reaeration, Dissolved oxygen, Hydraulics, \*Draft tubes, Model studies.  
Identifiers: \*Aspirators.

The rate at which reaeration of water can be accomplished through introduction of air in turbine draft tubes was studied. A laboratory model simulating flow in a draft tube downstream from a turbine was constructed. Independent control of rate of flow of air and rate of flow of water was accomplished. Dissolved oxygen content of flow before and after reaeration was measured. Dimensionless parameters of aeration efficiency, Froude number and air to water content were plotted.  
W73-07807

**ORGANIC WASTES AS A MEANS OF ACCELERATING RECOVERY OF ACID STRIP-MINE LAKES,**  
Missouri Univ., Columbia. Dept. of Civil Engineering.

D. L. King, and J. J. Simmer.  
Available from the National Technical Information Service as PB-219 264, \$3.00 in paper copy, \$1.45 in microfiche. Missouri Water Resources Center Completion Report, February 20, 1973. 65 p., 15 fig., 5 tab, 21 ref, append. OWRR A-038-MO (1). 14-31-0001-3225 and 3525.

Descriptors: \*Acid mine water, Coal mines, Nutrients, \*Aluminum, \*Ions, Lakes, \*Iron, Mine drainage, Sulfates, Metals, \*Organic wastes, Chemical wastes.  
Identifiers: \*Strip mine lakes.

In the presence of air and water, iron pyrite oxidizes to sulfuric acid and ferric hydroxide. The majority of the hydrogen ions associated with the sulfuric acid never reach the acid strip-mine lake because as they flow over the overburden they are involved in a series of reactions that are responsible for the weathering and dissociation of rocks, clays, and minerals. The majority of the sulfate ions, on the other hand, do reach the strip-mine lake and their concentration in the lake tends to indicate the amount of acid production in the particular watershed. The ferric hydroxide is also washed into the lake with the sulfate ions and settles to the bottom; however, a certain amount redissolves in the lake according to pH and Ksp limitations. Iron, sulfate, and hydrogen ions along with a host of acid dissociated ionic species, including aluminum, manganese, calcium, and magnesium, and allochthonous organic materials are constantly being washed into the acid strip-mine lake. It is these ions and organic matter that characterize the chemistry of these lakes. A small amount of buffer in the acid mine water is from the dissociation of  $\text{HSO}_4^-$ . Carbon dioxide and hydrogen sulfide gases also contribute considerably to the buffering of the water. However, it is the high concentration of such metals as aluminum and iron that make the greatest contribution to the net buffer capacity of the water. These metal buffers are responsible for the long natural recovery times associated with all acid strip-mine lakes. The amount of such buffers depends upon the amount and type of clays and minerals dissolved on the spoil banks. Depending on the clay type more or less aluminum may be dissolved and allowed to flow into the lake.  
W73-07808

**ECONOMIC BENEFITS FROM AN IMPROVEMENT IN WATER QUALITY,**  
Oregon Univ., Corvallis. Dept. of Agricultural Economics.

S. D. Reiling, K. C. Gibbs, and H. H. Stoevener.  
Copy available from GPO Sup Doc as EP1.23/3 (73-008), \$2.10; microfiche from NTIS as PB-219 474, \$1.45. Environmental Protection Agency, Socioeconomic Environmental Studies, Report EPA-R5-73-008, January 1973. EPA Project 16110 FPZ.

Descriptors: \*Benefits, Recreation, Water quality, Economics, Lakes, Camping, Sport fishing, \*Recreation demand, \*Water quality control, \*Oregon.  
Identifiers: Travel costs, On-site costs, \*Klamath Lake (Ore.).

A new methodology is introduced and empirically tested for estimating the economic benefits accruing to society from an improved recreational facility. The specific facility under consideration is Upper Klamath Lake, Oregon, which presently has low water quality. The methodology draws upon previous work done in the evaluation of recreational demand; however, it focuses upon the individual recreationist and separates the traditional price variable into on-site costs and travel costs. The model is used to estimate the number of days per visit the recreationist will stay at the site as the water quality improves. Data collected at three other lakes with varied characteristics are used to derive a relationship between the number of visits to a site and the characteristics of the site. This relationship is then used to estimate the increase in visits to Klamath Lake that would be forthcoming with an improvement in water quality. The impact of expanded recreational use of Klamath Lake upon the local economy is also estimated through the use of an input-output model of the Klamath County economy. (EPA)  
W73-07813

**WATER QUALITY CHANGES IN AN IMPOUNDMENT AS A CONSEQUENCE OF ARTIFICIAL DESTRACTION,**  
North Carolina Univ., Chapel Hill. School of Public Health.

For primary bibliographic entry see Field 05C.  
W73-07818

**IMPROVING WATER QUALITY BY REMOVAL OF PESTICIDES WITH AQUATIC PLANTS,**  
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.

S. W. Bingham.  
Available from the National Technical Information Service as PB-219 389, \$4.85 in paper copy, \$1.45 in microfiche. Virginia Water Resources Research Institute, Blacksburg, Bulletin 58, March 1973, 94 p., 31 fig., 9 tab, 20 ref. OWRR A-033-VA (3).

Descriptors: \*Pesticide removal, Herbicides, Water quality, \*Aquatic plants, \*Algae, Pesticide residues, Metabolism, \*Scenedesmus, Water quality control.  
Identifiers: \*Herbicide metabolism.

Several species of algae (axenic) and aquatic vascular plants were evaluated for effectiveness in removal of pesticides from water. Pesticides with 14C were utilized to determine plant uptake and molecule degradation. Herbicide concentrations below toxic levels were used; however, these were many times greater than natural residue levels encountered in surface water. It was evident that the plants removed herbicide residues from water, supporting the fact that residues have not yet accumulated in surface water to dangerous levels. Various algae were not equally effective in absorbing pesticides. *Scenedesmus* was particularly effective, and pH of the medium proved important with 2,4-D. In general, submersed species were

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not as effective in herbicide removal as emerged species. This may be related to transpiration and an avenue for translocation through the xylem. Herbicides were metabolized by various aquatic plants. Metabolites as well as the herbicide were released to the culture medium. Metabolism was rapid, particularly with algae. Algae and aquatic vascular plants contribute to the removal of pesticides from water and metabolize the chemicals to less active compounds in the environment. (Settle-Wisconsin) W73-07821

#### UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA, Minnesota Univ., Minneapolis. Water Resources Research Center.

J. J. Waelti.  
Available from the National Technical Information Service as PB-219 586, \$3.00 in paper copy, \$1.45 in microfiche. Minnesota University Agricultural Extension Service, Extension Bulletin 359, 1970, 27 p, 4 fig, 2 tab, 18 ref. OWRR A-019-MINN (1).

Descriptors: \*Water quality, \*Water quality control, \*Water pollution control, Pollutants, Economics, Economic efficiency, Federal government, State governments, Local governments, \*Minnesota.

In order to facilitate meaningful, rational debate and better communication between citizen and government, the more important aspects of the water pollution problem are discussed in elementary terms. Pollutants may be classified according to several criteria. For instance, pollutants may be (1) solid or liquid forms, (2) chemical, physical, or biological, (3) degradable or nondegradable, or (4) natural or manmade. Important problem areas discussed include (1) water quality problems in densely populated areas, (2) eutrophication and pollution on lakes, (3) agricultural pollution, and (4) industrial pollution. The losses resulting from water pollution include the direct loss of economic product, the misallocation of resources, and deleterious effects on social and aesthetic values. Next, the role of federal, state, and local governments in water quality control is outlined. The basic problems which a government and its constituents need to resolve include (1) what technical methods should be employed in improving water quality, (2) what level of water quality should be attained, and (3) what institutional means should be used to implement water quality control policy. Numerous technical terms commonly used in discussions of water quality control are carefully defined. (Settle-Wisconsin) W73-07822

#### ECONOMIC ASPECTS OF POLLUTION CONTROL, University of New England, Armidale (Australia).

R. M. Parish.  
Australian Economic Papers, Vol 11, No 18, p 32-43, June, 1972, 14 ref.

Descriptors: \*Pollutants, \*Pollution abatement, \*Economics, \*Economic efficiency, Equity, Negotiations, Regulation, Control, Cost-benefit analysis, Costs.  
Identifiers: Liability.

It is almost exclusively in connection with common-property resources, including the atmosphere and water, that severe pollution and congestion problems arise. With such resources there is often no effective barrier to their being utilized well beyond the optimum level. In these circumstances a social improvement could be effected by either reducing the intensity of use of the resource, or by changing the manner of use. In the absence of transaction costs, externalities will be internalized by negotiation. Furthermore, the outcome of the negotiations will be unaffected by the prevailing liability rules. However, once transactions costs

are considered, the particular liability rule affects the final equilibrium. An important cause of high transaction costs is uncertainty regarding the law itself. A government agency charged with regulating polluters will often have a wide range of choices open to it. In general, it must choose: (1) whether to reduce the level of pollution, or mitigate its effects, or both; (2) at what point in the pollution-production or pollution-consumption process to apply controls; and (3) what type of control or mitigation measure to apply. Each of these aspects are briefly examined. (Settle-Wisconsin) W73-07823

#### ALTERNATIVE FINANCING FOR STATE AND LOCAL WATER RESOURCES PROJECTS, Clemson Univ., S.C. Dept. of Economics.

For primary bibliographic entry see Field 06C. W73-07825

THE ENVIRONMENT AS PROBLEM: II,  
CLEAN RHETORIC AND DIRTY WATER,  
A. M. Freeman, III, and R. H. Haveman.  
The Public Interest, No 28, p 51-65, Summer, 1972.

Descriptors: \*Water pollution, \*Water pollution control, \*Regulation, \*Standards, Legal aspects, Economic efficiency, Pollution taxes (Charges).  
Identifiers: \*Laws, Subsidies.

In spite of the several environmental protection laws passed in the last 20 years, indices of environmental quality show that the waste loads imposed on environmental resources have been growing continuously, and rising waste loads mean deteriorating environmental quality. Present federal water pollution control policy has two main elements: (1) a program of federal subsidies to cities for the construction of waste treatment plants, and (2) a procedure for establishing regulations to limit discharges and for enforcing these rules. An examination of these two elements indicates that existing federal water pollution policy has distinctly failed to improve the quality of the nation's rivers. The federal subsidies in effect allow polluters to generate and dispose large quantities of wastes without bearing the full cost of their discharges. In fact, the taxpayers' money is used to clean up after them. In addition, the regulatory-enforcement strategy fails because it pits the control authorities against the polluters in an unending sequence of long, drawn out, and often inconclusive battles over licensing and the enforcement of regulations. A desirable alternative may be to impose user or effluent charges on waste dischargers such that the charge is related to the volume discharged. (Settle-Wisconsin) W73-07827

#### EPA ASSESSES POLLUTION CONTROL BENEFITS.

Environmental Science and Technology, Vol 6, No 10, p 882-883, October, 1972.

Descriptors: \*Water pollution control, \*Benefits, \*Costs, \*Evaluation, Standards, Methodology, Water pollution, Air pollution.

Identifiers: Environmental impact statements, Incentives.

A newly formed division of the Environmental Protection Agency, the Implementation Research Division (IRD), is presently attempting to assess the benefits of air and water pollution control. IRD consists of four branches. The Economic Analysis Branch is on a crash project to assess the benefits associated with pollution control. It will attempt to derive benefit and cost estimates in the human health, materials, animals, vegetation, recreation, and aesthetics areas. The distribution of costs and benefits among the population will also be studied.

A second project will estimate the economic damages of water pollution in 1970. A second branch, Ecological Studies and Technology Assessment, will concentrate on the research needed to comment effectively on the environmental impact statements. A third branch, Standards Research, will work on the development of better methodology for evaluating standards, particularly for alternative approaches developed by the Economic Analysis Branch. The fourth branch, Systems Evaluation, has as its main thrust the assignment of identifying incentives and related fiscal inducements to promote pollution control. That is, how can taxes, effluent charges, subsidies, and other fiscal incentives be used to get a better quality environment with minimum costs and inconvenience to society. (Settle-Wisconsin) W73-07829

#### MODELS OF INDUSTRIAL POLLUTION CONTROL IN URBAN PLANNING, RAND Corp., Santa Monica, Calif.

D. P. Tishany.  
Available from the National Technical Information Service as AD742 401, \$3.00 in paper copy, \$1.45 in microfiche. January, 1972. 47 p, 15 fig, 3 tab, 36 ref.

Descriptors: \*Industrial wastes, \*Pollution abatement, \*Water pollution control, Cities, Economic efficiency, Mathematical models, Profit, Optimization, Standards.

To predict the economic implications of air and water quality management, some simple mathematical models are formulated. The process modeled is one in which urban industries maximize the present value of their aggregate profits over a discretized time span subject to constraints on environmental quality and resource allocation. The model provides quantitative estimates of the responses of the following variables to changes in air and water quality standards: (1) individual profits at each firm and aggregate regional profit; (2) industry output levels; (3) input requirements for manufacturing activities; and (4) resource outlays for gaseous and liquid waste control. Primary effects of enforced waste control on one industry are a diversion of its input resources from manufacturing to pollution control and consequent reduction of output and demand. Secondary effects may involve a decrease in the profits of other industries. The models are based on several restrictive assumptions including (1) a closed regional system with only five industries; (2) linear transport equations; (3) functional relationships based upon recent empirical findings; and (4) exogenously determined prices. These models are not precise enough to indicate the most efficient allocation of resources among firms within a real economy. (Settle-Wisconsin) W73-07831

#### SYSTEMS APPROACH TO WATER QUALITY MANAGEMENT, Water Resources Engineers, Inc., Walnut Creek, Calif.

For primary bibliographic entry see Field 05B. W73-07922

#### REPORT OF THE CLINCH VALLEY STUDY, MAY 15-JUNE 2, 1972. Oak Ridge National Lab., Tenn.

Available from NTIS, Springfield, Va., as ORNL-4835, \$3.00 per copy, \$1.45 microfiche. Report No ORNL-4835, Jan. 1973. 68 p, 7 ref, 7 append.

Descriptors: \*Nuclear powerplants, \*Accidents, \*Hazards, \*Safety, \*Population, \*Radioactivity, Effluents, Radioisotopes, Strontium, Cesium, Iodine, Safety, Toxicity, Public health, Food chain.

Identifiers: \*Emergency procedure.

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A number of topics are discussed which affect the handling of an accidental radioactivity release from a nuclear power plant. Principal attention is given to those matters that decrease the threat to the population surrounding the site of the power plant. Recommendations are made to improve existing emergency plans. Procedures and methods are listed which have proved useful in handling other types of emergencies and appear to have use during a radioactivity release. Also discussed are emergency control centers, construction modifications to the nuclear power plants, chemical prophylaxis, and improvised respiratory protection. (Houser-ORNL)

W73-07938

#### RADIOACTIVE-WASTE MANAGEMENT, Cambridge Nuclear Corp., Billerica, Mass.

J. J. Fitzgerald.

In: *Applied Radiation Protection and Control*, Vol 2, Aug 1969, Gordon and Breach, Science Publishers, New York, London, Paris. p 747-818, 23 fig, 20 tab, 77 ref.

Descriptors: \*Waste disposal, \*Radioactive waste disposal, \*Nuclear wastes, \*Waste storage, \*Waste treatment, \*Effluents, Water pollution, Water pollution sources, Nuclear powerplants, Environment, Environmental engineering, Monitoring, Assay, Analytical techniques, Waste identification, Public health, Path of pollutants, Management, Professional personnel, Technology, Training.

During the last decade there has been rapid growth in the use of radioactive materials and ionizing radiation. With the increased use of ionizing radiation sources, there has been a corresponding increase in the need for the recruitment and education of health physicists, radiological engineers, and radiological health specialists to evaluate the potential hazards and to provide radiation protection and control measures. This text has been prepared to help both student and professional radiological specialists to obtain a relatively broad view of radiation protection and control methods and applications. The text includes information on administration as well as technical measures in the conducting of applied radiation protection and control programs. The section on Radioactive-Waste Management treats in detail the aspects of sources and magnitude, policies, handling, storage, disposal and public-relations problems of radioactive waste. (Houser-ORNL)

W73-07954

#### RESEARCH NEEDS FOR IRRIGATION RETURN FLOW QUALITY CONTROL, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering

G. V. Skogerboe, and J. P. Law, Jr.

Copy available from GPO Sup Doc as EP1.16: (13030-11/71), \$1.00; microfiche from NTIS as PB-219 979, \$1.45. Water Pollution Control Research Series, Environmental Protection Agency, November 1971, 98p, 9 fig, 9 tab, 31 ref. EPA Project 13030-11/71.

Descriptors: \*Research priorities, Water pollution effects, Water pollution sources, \*Water quality control, \*Fertilizers, Irrigation water, Nematodes, Nitrates, Phosphates, Salinity. Identifiers: \*Return flow, Irrigated land, \*Irrigated systems.

Specific research needs regarding irrigation return flow quality that are required to undertake an effective control program are described. These research needs include irrigation practices, soil-plant-salinity relationships, leaching requirements, prediction of subsurface return flow, cultural practices, irrigation scheduling, treatment of return flows, economic evaluations, and institutional control methods. (EPA)

W73-07965

#### COPAN LAKE, LITTLE CANEY RIVER, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Tulsa, Okla.

For primary bibliographic entry see Field 08A. W73-07979

#### SNAGGING AND CLEARING PROJECT ON MILL CREEK AT RIPLEY, WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Huntington, W. Va.

For primary bibliographic entry see Field 04A. W73-07981

#### MICHIGAN'S ENVIRONMENTAL PROTECTION ACT OF 1970: A PROGRESS REPORT, Michigan State Univ., East Lansing.

J. L. Sax, and R. L. Conner.

Michigan Law Review, Vol 20, no 6, p 1003-1106, May 1972. 104 p, 309 ref, 9 append.

Descriptors: \*Michigan, \*Legislation, \*Judicial decisions, \*Administrative agencies, Legal aspects, Water pollution control, Remedies, Water quality control, Jurisdiction, Decision making, Eminent domain, Constitutional law.

Identifiers: \*Standing, \*Citizen suits, Michigan Environmental Protection Act.

Michigan's Environmental Protection Act of 1970 represents a departure from the longstanding tradition under which control of environmental quality has been left almost exclusively in the hands of regulatory agencies, since it gives to ordinary citizens an opportunity to take the initiative in environmental law enforcement. Moreover, the act enlarges the role of the courts because it permits a plaintiff to assert that his right to environmental quality has been violated in much the same way that one has always been able to claim that a property right has been violated. Every significant legal issue, including the Act's constitutionality, remains unresolved by appellate courts. The small number of cases filed under the act shows the statute is not as easily accessible a tool as its supporters had hoped. Two encouraging features in the Act's history are the expedition with which most cases have been handled and the willingness of the courts to face up to the environmental issues that divide the parties. (Mockler-Florida)

W73-07982

#### ADMINISTRATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT, PART I.

For primary bibliographic entry see Field 06E. W73-07983

#### PROJECTS PROPOSED FOR INCLUSION IN OMNIBUS RIVER AND HARBOR AND FLOOD CONTROL LEGISLATION-1972.

Joint Hearings—Subcomm. on Rivers and Harbors, Subcomm. on Flood Control and Internal Development—Comm. on Public Works, U.S. House of Representatives, 92d Cong, 2d Sess, February 17, 22, 24, 29 and March 2, 1972. 312 p, 3 fig, 20 plate, 1 map, 2 tab, 5 chart.

Descriptors: \*Environmental effects, \*Rivers and Harbors Act, \*Legislation, \*Flood control, Water resources development, Federal government, Flood protection, Federal budget, Administrative agencies, Erosion control, Beach erosion, Navigation, Wildlife, Recreation facilities, Flood damages, Channel improvement, Harbors, River regulation. Identifiers: \*Congressional hearings.

The subcommittees heard testimony concerning the environmental effects of twenty-six new flood control and river and harbor projects costing over \$210 million. Six of the projects are in the navigation and beach erosion categories, eighteen in

flood control and hurricane protection categories, and two involve fish and wildlife conservation at existing projects. All environmental statements required by the National Environmental Policy Act of 1969 have been prepared for each of the projects and the requirement of construction and maintenance of recreational facilities within each project has been fulfilled. The President's 1973 budget proposal providing substantial increases for ongoing water resources projects to avoid the under-financing of past years while limiting new construction to a modest level was emphasized by several speakers. Included are environmental statements for several of the projects. (Beardaley-Florida)

W73-07984

#### REPORT OF PROCEEDINGS AT PUBLIC HEARINGS RELATING TO APPLICATIONS FILED TO THE WATER AND AIR QUALITY CONTROL COMMITTEE OF THE NORTH CAROLINA BOARD OF WATER AND AIR RESOURCES.

North Carolina Board of Water And Air Resources, Raleigh. Water and Air Quality Control Committee.

March 30, 1972. 84 p.

Descriptors: \*North Carolina, \*Water quality standards, \*Classification, \*Water quality control, Water control, Water zoning, Water resources development, Water utilization, Water pollution control, Adjudication procedure, Recreation, Water supply, Waste water (Pollution). Identifiers: \*Cape Fear River Basin.

Proceedings are reported of the public hearing held on applications requesting the reclassification of certain bodies of water in the Cape Fear River Basin, North Carolina, so that they may be protected and maintained in a suitable condition for the reclassified use. The reclassification was requested in order to protect the waters for fishing and secondary recreation, to protect certain waters as a source of raw water for the University of North Carolina and to protect certain waters for bathing and other water-body contact recreation. A transcript of the hearings containing testimony from interested agencies and citizens is included, as well as prepared reports concerning the specific waters subject to possible reclassification. (Mockler-Florida)

W73-07987

#### PROPOSED RECLASSIFICATIONS OF CERTAIN WATERS IN THE CHOWAN, NEUSE, PASQUOTANK, ROANOKE, TAR-PAMlico, AND WHITE OAK RIVER BASINS, ETC.

North Carolina Board of Water and Air Resources, Raleigh. Water and Air Quality Control Committee.

1973. 35 P, 3 TAB.

Descriptors: \*North Carolina, \*Classification, \*Water quality standards, \*Water quality control, River basins, River basin development, Regulation, River systems, Water utilization, Water pollution control, Standards, Evaluation.

The proposed reclassification of certain streams in the Chowan, Neuse, Pasquotank, Roanoke, Tar-Pamlico and White Oak River Basins to be considered at public hearings is explained. An evaluation of all surface waters in the above named river basins have been carefully made in accordance with the quality of the waters and the best usage of the waters; the proposal seeks to reclassify them with reference to their best usage and in the best interest of the public. Present classifications and use of the river basins are given, as well as the proposed changes in classification. Comprehensive tables and charts are included, representing an exhaustive and well planned study of the river

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basins in their present use as well as pertinent information regarding their use when reclassified. (Mockler-Florida)  
W73-07988

#### NEW CLASSIFICATION ASSIGNED TO CERTAIN WATERS IN THE CAPE FEAR RIVER BASIN.

North Carolina Board of Water and Air Resources, Raleigh.

Resolutions of March 30, 1972. 3 p.

Descriptors: \*North Carolina, \*Classification, \*Water quality standards, \*Water quality control, River basins, Tributaries, Water rights, Water law, Water policy, Water resources development, Water management (Applied), Water pollution control, Adjudication procedure.

Identifiers: \*Cape Fear River Basin, \*Re-classification (Water quality standards).

The reclassification of certain waters in the Cape Fear River Basin establishes new water quality standards for Buckhorn Creek and its tributaries flowing through Wake County, North Carolina, the waters of Bolin Creek flowing through the town of Chapel Hill, North Carolina, and Cane Creek and its tributaries flowing through Orange County. The reclassification, a result of written applications and public hearings, are discussed along with a description of the concerned subject waters. Any natural, unnamed tributaries in the basin will carry the same classification as that of the segment to which it is tributary. Additionally, those tributaries not specifically covered will continue to carry the same classification. (Mockler-Florida)  
W73-07989

#### (ANNUAL REPORT OF THE DELAWARE RIVER BASIN COMMISSION, 1972).

Delaware River Basin Commission, Trenton, N.J. For primary bibliographic entry see Field 06E.  
W73-07990

#### ENVIRONMENTAL IMPACT STATEMENTS—A DUTY OF INDEPENDENT INVESTIGATION BY FEDERAL AGENCIES.

For primary bibliographic entry see Field 06E.

W73-07993

#### PRIVATE REMEDIES FOR BEACH FRONT PROPERTY DAMAGE CAUSED BY OIL POLLUTION OF MISSISSIPPI COASTAL WATERS, M. Soper.

Mississippi Law Journal, Vol XLIII, No 4, p 516-537, 1972. 161 ref.

Descriptors: \*Mississippi, \*Oil pollution, \*Coasts, \*Oil spills, Riparian rights, Legal review, Legislation, Law enforcement, Riparian land, Judicial decisions, Negligence, Penalties (Legal), Water pollution, Beaches, Water pollution sources, Legal aspects, Damages, State government, Federal government, State jurisdiction, Common law, Trespass.  
Identifiers: Nuisance (Legal aspects).

Remedies are discussed that a Mississippi citizen owning beach-front property along the Gulf-coast may have for damage caused to his property by the discharge of oil from sea-going vessels. At present there is no Mississippi act which gives a landowner a private right to sue for cleanup or oil damage to his beach property. The state does have legislation, such as the Mississippi Air and Water Pollution Control Act of 1966, which adequately protects state interests; however, existing state law gives no statutory rights to an injured individual landowner. The best avenue presently open to an individual beach property owner for private redress for oil damage is found in the common law

actions of trespass, negligence, and nuisance. These remedies are predicated upon the fact that one who owns beach-front property in Mississippi has riparian rights which can be protected through these three common law actions. There are, however, difficulties in maintaining these private civil actions. Federal laws, like Mississippi statutory law, are adequate only to the extent that they protect the national interest. State laws are needed to provide for strict liability for damage to private parties. (Adams-Florida)  
W73-07994

#### THE ENERGY NEEDS OF THE NATION AND THE COST IN TERMS OF POLLUTION, Atomic Energy Commission, Washington, D.C.

For primary bibliographic entry see Field 06G.  
W73-07995

#### THE YEAR OF SPOILED PORK: COMMENTS ON THE COURT'S EMERGENCE AS AN ENVIRONMENTAL DEFENDER, Florida Univ., Gainesville.

W. A. Rosenbaum and P. E. Roberts.

Law and Society Review, Vol 7, No 1, p 33-60, Fall 1972. 28 ref.

Descriptors: \*Judicial decisions, \*Legal review, \*Decision making, \*Administrative agencies, \*Administrative decisions, Water resources, Water law, Project planning, Alternate planning, Cost-benefit analysis, Legal aspects, Political aspects, Federal government, Standards, Water pollution, Recreation, Environmental effects, Legislation.

Identifiers: \*National Environmental Policy Act, \*Sovereign immunity, \*Environmental Impact Statements, Standing (Legal).

Federal water resources projects have been consistently challenged by environmentalists because of the fact that Congress frequently votes for projects on the basis of political expediency without considering their ecological impact. The major line of attack upon these projects has been through the courts. There are four crucial legal issues which emerge from environmental lawsuits. First, it must be determined if the government can be sued. This depends upon whether environmentalists have standing, and whether the government enjoys sovereign immunity. Second, can projects which have already been begun be subjected to suit. Third, are benefit-cost calculations susceptible to judicial review. Fourth, what effect will the National Environmental Policy Act (NEPA) and its impact statements have on these lawsuits. Recently a lower court adopted a twin test for the acceptability of NEPA environmental impact statements: they must be submitted in good faith, and they must alert decision-makers to major environmental problems involved in the particular project. If this test is upheld, the effect would be to remove the judiciary from substantive investigations of impact statements, thus diminishing the value of the courts as a means for attacking pork-barrel projects. (Adams-Florida)  
W73-07996

#### F. W. GUEST MEMORIAL LECTURE: RIVER POLLUTION AND THE LAW, G. H. Newsom.

Otago Law Review, Vol 2, No 4, p 383-392, August 1972. 11 ref.

Descriptors: \*Foreign countries, \*Penalties (Legal), \*Legislation, \*Water pollution control, \*Riparian rights, Natural flow doctrine, Water law, Legal aspects, Water rights, Banks, Ownership of beds, Riparian waters, Trespass, Common law, Judicial decisions, Fish, Fisheries, Law enforcement.

Identifiers: \*New Zealand, \*Comparative law, Injunctions (Prohibitory), Nuisance (Legal aspects), England.

This address, delivered in New Zealand in 1971 by a noted English jurist, provides both an account of the English experience in river pollution over the last twenty years, and a critique of New Zealand's legislative efforts to combat river pollution. The most effective weapon utilized in England against river pollution has been, traditionally, common law actions by riparian owners. England has passed a series of acts in order to deal with the problem. These acts, such as the Rivers Act of 1951, and the subsequent Act of 1961, provide for criminal penalties, including imprisonment, for habitual offenders. The laws, both civil and criminal, are now adequate. The problem remains with enforcement; but this can be solved by official resolution and good organization. As for New Zealand's efforts in water pollution control, current legislation contains inadequate penalties. Inclusion of penalties of imprisonment is suggested in order to put teeth into the laws. Another major weapon to be used against river pollution is the organization of public opinion on a massive scale. (Adams-Florida)  
W73-07997

#### CRIMINAL LIABILITY UNDER THE REFUSE ACT OF 1899 AND THE REFUSE ACT PERMIT PROGRAM.

For primary bibliographic entry see Field 06E.  
W73-07998

#### ENVIRONMENTAL LAW: STRICT COMPLIANCE WITH PROCEDURAL REQUIREMENTS OF NEPA—THE AGENCIES MUST PLAY BY THE RULES, For primary bibliographic entry see Field 06E. W73-07999

#### DEPARTMENT OF NATURAL RESOURCES; DIVISION OF WATER POLLUTION CONTROL.

For primary bibliographic entry see Field 06E.  
W73-08000

#### SEEGRAN V. ENVIRONMENTAL PROTECTION AGENCY (PETITION FOR HARSHSHIP VARIANCE FOR USE OF SANITARY SEWERS).

For primary bibliographic entry see Field 06E.  
W73-08008

#### STALEY MANUFACTURING CO. V. ENVIRONMENTAL PROTECTION AGENCY (REGULATION OF DISCHARGES FROM PRIVATE SEWER INTO MUNICIPAL SEWER).

For primary bibliographic entry see Field 06E.  
W73-08009

#### REEDS CONTROL EUTROPHICATION OF BALATON LAKE, Research Inst. for Water Resources Development, Budapest (Hungary).

L. Toth.  
Water Research, Vol 6, No 12, p 1533-1539, December 1972. 3 fig, 3 tab, 13 ref.

Descriptors: \*Sewage treatment, \*Effluents, \*Water pollution control, Aquatic plants, Water pollution sources, Nitrogen, Phosphorus, \*Eutrophication, Water quality control.

Identifiers: \*Reeds, \*Balaton Lake (Hungary), Macrophytes.

As part of a study on the eutrophication of Lake Balaton, information is presented on the sewage discharged from the sewage purification plants at Tibany, Balatonfured, and Keszthely into Lake Balaton directly and through stands of reed. Samples of effluent were filtered through Sartorius membrane with a pore size of 0.45 micron and determinations were made of organic nitrogen and phosphorus. The measurements performed at Balatonfured and Tibany show that in July, i.e. in the

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period of small load (Balatonfured: total P equals 5.28 ppm, total N equals 30.4 ppm, Tibany: total P equals 4.50 ppm, total N equals 19.97 ppm) and in August, in the period of maximum load (Balatonfured: total P equals 6.25 ppm, total N equals 45.4 ppm) the phosphorus and nitrogen content of the sewage effluent which flows through the reeds is consumed by the organisms living there (the living coating of reed stalks, algae, bacteria, etc.) and only small amounts of it get into the lake from the side of the reeds bordering on open water (Tibany: total P equals 0.081 and 0.01 ppm, total N equals 0.81 and 0.78 ppm). With regard to lake protection two conflicting observations were made. The lake is said to be protected by the reeds only during one season, as in the autumn when the reeds die down. The materials retained by them are mixed with lake water by waveaction. On the other hand, the food materials discharged into the reeds and stabilized in the bodies of the living organisms there which are either eaten by fish or leave the water for dry land, might decrease the trophic grade of the lake. The optimal quantity of reedy areas in Lake Balaton should be determined because the reeds are important in protecting the water quality of the lake. (Holoman-Battelle)  
W73-08025

**PROCEEDING 1971 TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.**  
Oregon State Univ., Corvallis.  
For primary bibliographic entry see Field 05B.  
W73-08051

**THE DEVELOPMENT PLAN FOR HARBISTOWN TOWNSHIP, MACON COUNTY, ILLINOIS.**  
Macon County Regional Plan Commission, Decatur, Ill.  
For primary bibliographic entry see Field 06B.  
W73-08052

**SHORELINE MANAGEMENT PLAN FOR THE ESCAMBIA-SANTA ROSA REGION.**  
Smith (Milo) and Associates, Tampa, Fla.  
For primary bibliographic entry see Field 06B.  
W73-08053

**EFFECTS OF LAND USE ON WATER RESOURCES.**  
Federal Water Pollution Control Administration, Washington, D.C.  
For primary bibliographic entry see Field 04C.  
W73-08054

**THE INTENSITY OF DEVELOPMENT ALONG SMALL AND MEDIUM SIZED STREAMS IN SURBURBAN PHILADELPHIA.**  
Regional Science Research Inst., Philadelphia, Pa.  
For primary bibliographic entry see Field 03D.  
W73-08055

**FUNCTIONAL PLANNING AND PROGRAMMING: HOUSING, WATER AND SEWER, RECREATION, LAND USE, ADMINISTRATION.**  
Mark Twain Regional Planning Commission, Macon, Mo.  
For primary bibliographic entry see Field 06B.  
W73-08056

**PH AND SOLUBLE CU, NI AND ZN IN EASTERN KENTUCKY COAL MINE SPOIL MATERIALS.**  
Kentucky Univ., Lexington. Dept. of Agronomy.  
For primary bibliographic entry see Field 05B.  
W73-08058

**WINERY INNOVATES WASTE TREATMENT.**  
For primary bibliographic entry see Field 05D.  
W73-08054

**OXYGEN DIFFUSION IN WET AIR OXIDATION PROCESSES.**  
Naval Research Lab., Washington, D.C.  
For primary bibliographic entry see Field 05D.  
W73-08102

**TECHNOLOGIES FOR SHIPBOARD OIL-POLLUTION ABATEMENT: EFFECTS OF OPERATIONAL PARAMETERS ON COALESCENCE.**  
Naval Ship Research and Development Center, Annapolis, Md.  
For primary bibliographic entry see Field 05D.  
W73-08106

**BUREAU OF RECLAMATION,**  
Bureau of Reclamation, Denver, Colo. Applied Sciences Branch.  
W. P. Simmonds, L. A. Haugseth, and L. O. Timblin.  
Journal of the American Water Works Association, Vol 64, No 10, p 624-627, October 1972. 4 fig.

Descriptors: Water resources, \*Water resources development, \*Water reuse, Precipitation (Atmospheric), Water management, Water pollution control, Water policy, Water quality, Water quality control, Laboratory tests, Laboratory equipment, Geothermal studies, Surveys.  
Identifiers: \*Bureau of Reclamation.

The Bureau of Reclamation of the Department of the Interior is concerned with conceiving, evaluating, planning, designing, constructing, operating, and maintaining water resource related projects that maximize social, environmental and economic benefits for the area in the 17 Western States. The Bureau is concentrating present research on new water supplies in the geothermal resources and precipitation management fields. A study is also being made to identify the locations, amounts, and characteristics of various waste waters under the Inventory of Waste Water Reclamation Opportunities Program. Laboratory and field evaluations of techniques, structures, and equipment for use in waste water reclamation projects are also underway. Furthermore, Bureau research involves a continuing effort on methods of water quality determination and evaluation. (Smith-Texas)  
W73-08108

**HEAVY METALS REMOVAL IN WASTE WATER TREATMENT PROCESSES: PART 1.**  
Orange County Water District, Santa Ana, Calif.  
For primary bibliographic entry see Field 05D.  
W73-08117

**CONVERTING AMD TO POTABLE WATER BY ION EXCHANGE TREATMENT.**  
Chester Engineers, Inc., Coraopolis, Pa.  
For primary bibliographic entry see Field 05D.  
W73-08118

**WARWICK MINE NO. 2 WATER TREATMENT.**  
For primary bibliographic entry see Field 05D.  
W73-08124

**HUMAN WASTE POLLUTION IN UNITED STATES FORESTS.**  
Environmental Protection Center, Inc., Inglewood, Calif.  
For primary bibliographic entry see Field 05B.  
W73-08134

**THE APPLICATION OF SNOWMELT FORECASTING TO COMBAT COLUMBIA**

**RIVER NITROGEN SUPERSATURATION PROBLEMS.**  
Corps of Engineers, Portland, Oreg. North Pacific Div.  
For primary bibliographic entry see Field 02C.  
W73-08142

**CLEAN WATER FOR SAN FRANCISCO BAY.**  
California State Water Resources Control Board, Sacramento.  
For primary bibliographic entry see Field 06E.  
W73-08176

**REGIONAL WATER AND SEWER GUIDE.**  
Upper Savannah Planning and Development District, Greenwood, S.C.  
For primary bibliographic entry see Field 06D.  
W73-08177

**THE CLEAN STREAMS LAW OF PENNSYLVANIA.**  
Pennsylvania Dept. of Environmental Resources, Harrisburg.  
For primary bibliographic entry see Field 06E.  
W73-08183

**INVENTORY OF INTERSTATE CARRIER WATER SUPPLY SYSTEMS.**  
Environmental Protection Agency, Washington, D.C. Water Supply Div.  
For primary bibliographic entry see Field 05F.  
W73-08192

**THE IMPACT OF THE NATIONAL ENVIRONMENTAL POLICY ACT UPON ADMINISTRATION OF THE FEDERAL POWER ACT.**  
For primary bibliographic entry see Field 06G.  
W73-08195

**HOW AN ENFORCER BECOMES THE POLLUTER'S DEFENDER,**  
W. L. Moonan.  
Juris Doctor, p 24, 25, 36, February 1973. 1 photo.

Descriptors: \*Legal aspects, \*Pollution control, \*Pollution abatement, \*Water law, Water policy, Industries, Economic impact, Social aspects, Industrial wastes, Industrial production, Administration, Standards, Water pollution sources.

An interview is described with a New Jersey attorney who is one of a growing number of anti-environmental lawyers. Until 1970, he was one of the New Jersey Attorney General's top environmental law enforcers. He expresses concern for the effect of pollution control on the economy, fearing that the costs of cleanup will put many companies out of business and increase unemployment. He is now a partner in a private law firm, and has polluting companies waiting in line for his services. However, he is selective in his cases and will only handle companies who are sincerely interested in pollution control, and are not simply attempting to avoid their responsibility. As he says, he still cares about pollution. (Glickman-Florida)  
W73-08196

**THE WATER RESOURCES COUNCIL.**  
National Water Commission, Arlington, Va.  
For primary bibliographic entry see Field 06E.  
W73-08198

**DEPARTMENT OF ECOLOGY.**  
Washington Natural Resources and Recreation Agencies, Olympia.  
For primary bibliographic entry see Field 06G.  
W73-08200

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5G—Water Quality Control

**DIGEST OF PROPOSED REGULATION RELATING TO MONITORING AND REPORTING WASTEWATER DISCHARGES AND THEIR EFFECTS UPON RECEIVING WATERS.**  
For primary bibliographic entry see Field 05D.  
W73-08202

**REPORT OF THE UNITED NATIONS CONFERENCE ON HUMAN ENVIRONMENT, HELD AT STOCKHOLM, 5-16 JUNE, 1972.**  
For primary bibliographic entry see Field 06G.  
W73-08203

**LEGAL ASPECTS OF COASTAL ZONE MANAGEMENT IN ESCAMBIA AND SAN ROSA COUNTIES, FLORIDA (ESCAROSA).**  
For primary bibliographic entry see Field 06E.  
W73-08204

**IMMINENT IRREPARABLE INJURY: A NEED FOR REFORM.**  
C. L. Hellerich.  
Southern California Law Review, Vol. 45, p. 1025-1061, 1972. 37 p, 145 ref.

**Descriptors:** \*Remedies, \*Judicial decisions, \*Damages, \*Adjudication procedure, Legal aspects, Jurisdiction, Water policy, Local governments, Water pollution control, Environmental effects, Water law, Law enforcement.  
**Identifiers:** \*Injunctive relief, Citizens suits, National Environmental Policy Act, Nuisance (Legal aspects).

The most frequently requested remedy in environmental lawsuits is an injunction; however, in order to obtain one the plaintiff usually must show imminent irreparable injury. The requirement that the threatened harm be both immediate and practically certain to occur is no longer acceptable in today's era of over-population, over-industrialization, and new and expanding technology. Also discussed are other needed reforms in the court system, the imminent threat of long-term damage unless procedures are changed, and the authority for reform of the imminent irreparable injury doctrine. The imminent irreparable injury doctrine should be expanded to include future as well as uncertain harm. Various procedural alternatives are set forth with recommendations that the courts reevaluate and restructure their remedies to make them more responsive. (Mockler-Florida)  
W73-08205

**ENVIRONMENTAL LAW—PRIVATE CAUSE OF ACTION UNDER THE RIVERS AND HARBORS APPROPRIATION ACT OF 1899 FOR INJURY TO THE ECOLOGY OF NAVIGABLE WATERS,**

Texas Law Review, Vol. 50, No 6, p 1255-1264, August 1972. 60 ref.

**Descriptors:** \*Rivers and Harbors Act, \*Constitutional law, \*Judicial decisions, \*Law enforcement, Legislation, Jurisdiction, Legal review, Penalties (Legal), Permits, River regulation, Navigation, Water pollution control, Pollution abatement, Navigable waters, Ecology, Environmental control, Environmental effects, Wildlife conservation, Estuarine fisheries.  
**Identifiers:** \*Standing (Legal), \*Citizen suits, Injunctions (Prohibitory).

Section 10 of the Rivers and Harbors Act of 1899 makes it unlawful to excavate or fill any navigable water of the United States unless a permit has been obtained from the Army Corps of Engineers. Recently, private citizens have brought suit for damages and injunctive relief under the Act in order to prevent harm to the environment. These suits have raised the question of whether private citizens have standing under the Act. Courts which have allowed citizen suits have imposed two

prerequisites: (1) the private plaintiff must be threatened with special injuries, and (2) the special injury must be within the Act's zone of protection. This latter requirement causes attention to focus on the purposes of the 1899 Act. A 1970 case, *Zabel v. Tabb*, extended the Act to protect the ecology of navigable waters by emphasizing the congressional policy in favor of environmental protection. The first decision to recognize a right to protect the environment through private enforcement of the 1899 Act was based upon the grounds that the plaintiff's would suffer a direct and personal injury from destruction of fisheries and wildlife. (Adams-Florida)  
W73-08207

**THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 SAVED FROM 'CRABBED INTERPRETATION'.**  
For primary bibliographic entry see Field 06E.  
W73-08208

**SMALL BOAT HARBOR, KING COVE, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Anchorage, Alaska.  
For primary bibliographic entry see Field 08D.  
W73-08209

**SMITHVILLE LAKE, LITTLE PLATTE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Kansas City, Mo.  
For primary bibliographic entry see Field 08A.  
W73-08210

**WALKER DAM IMPOUNDMENT, AQUATIC PLANT CONTROL PROJECT, NEW KENT COUNTY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Norfolk, Va.

Available from the National Technical Information Service as EIS-VA-72-5511-F, \$3.75, in paper copy, \$0.95 in microfiche. May 15, 1972. 24 p, 2 map, 3 photo, 1 tab.

**Descriptors:** \*Virginia, \*Environmental effects, \*Aquatic weed control, \*Fishkill, Aquatic environment, Water quality, Environmental control, Recreation, Water chemistry, Water conservation, Weed control, Herbicides, Diquat, Aquatic weeds, Impoundments, Reservoirs, Oxygen requirements.  
**Identifiers:** \*Egeria, New Kent County (Virginia), \*Environmental impact statements.

The proposed project would initiate a program in conjunction with the state, designed to control infestation of *Egeria*, an aquatic weed, through chemical treatment with a 50-50 mixture of herbicide diquat bromide and potassium endothall. The control of *Egeria* would increase recreational activity, insure adequate water velocities for intake systems and increase fish production on the reservoir. However, adverse environmental effects would include minor fish kills, reduction in available dissolved oxygen associated with bacterial oxidation of dead plants, rendering of reservoir water unsuitable for drinking purposes for approximately two weeks, and potential damage to a tree farm near the upper reaches of the lake. Alternatives to the proposed project include no improvement, alteration of the lake habitat through water level reduction, mechanical control of aquatic vegetation, and removal of nutrient sources. (Mockler-Florida)  
W73-08212

**VIRGINIA BEACH, VIRGINIA—BEACH EROSION CONTROL AND HURRICANE PROTEC-**

**TION (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Norfolk, Va.  
For primary bibliographic entry see Field 08A.  
W73-08213

**CONSTRUCTION OF ARTIFICIAL REEFS IN THE ATLANTIC OCEAN OFF CAPE HENRY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
National Marine Fisheries Service, Beaufort, N.C.  
Atlantic Coastal Fisheries Center.  
For primary bibliographic entry see Field 06G.  
W73-08215

**WILLOW ISLAND LOCKS AND DAM OHIO RIVER, OHIO AND WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Huntington, W. Va.  
For primary bibliographic entry see Field 08A.  
W73-08216

**PEARL RIVER BASIN, EDINBURG DAM AND LAKE, MISSISSIPPI AND LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Mobile, Ala.  
For primary bibliographic entry see Field 08A.  
W73-08221

**KANAWHA RIVER COMPREHENSIVE BASIN STUDY, NORTH CAROLINA, VIRGINIA, AND WEST VIRGINIA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Ohio River Basin Commission, Cincinnati.  
For primary bibliographic entry see Field 04A.  
W73-08222

**LITTLE CALUMET RIVER: LAKE CALUMET HARBOR.**  
For primary bibliographic entry see Field 06E.  
W73-08233

**CHANGES IN THE MICROBIAL POPULATIONS OF A RESERVOIR TREATED WITH THE HERBICIDE PARAQUAT,**  
University of Wales Inst. of Science and Tech., Cardiff.  
For primary bibliographic entry see Field 05C.  
W73-08239

**THE FISH FAUNA OF NERA RIVER AND ITS PROTECTION, (IN RUMANIAN)**  
Academia R.S.R., Bucharest. Institutul de Biologie.  
P. Banrescu, and T. Oprescu.

Ocrotrea Nat. Vol 15, No 2, p 138-148, 1971. Illus. English summary.

**Identifiers:** \*Barbus-Meridionalis, \*Chondrostoma-Nasus, Cobitis-Elongata, Fauna, Fish, \*Nera River, Protection, River, \*Romania, Snails.

The fish-fauna of Nera River (Southern Banat, Romania) include 28 spp. (19 autochthonous ones and 9 ascending the river from the Danube). The most abundant species are *Chondrostoma nasus* and *Barbus meridionalis petenyi*. The most interesting species is *Cobitis elongata*, a preglacial relict, occurring also in some tributaries to the Danube from Yugoslavia and Bulgaria. It is necessary to protect these fish species as well as the whole aquatic fauna of this river, which includes some remarkable prosobranchiate snails, by preventing any pollution of the river or of its tributaries upwards from the gorges. The protection only of the gorges is not sufficient.—Copyright 1972, Biological Abstracts, Inc.  
W73-08269

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Water Quality Control—Group 5G

**OCTOMITUS TRUTTAE SCHMIDT, A PARASITE OF YOUNG TROUT IN THE FARM FISHPOND JADRO SOLIN, (IN SERBO-CROATIAN),**  
Pastrvsko Ribogojilistvo Jadro, Solin (Yugoslavia).  
V. Bulovac, R. Vukovic, and P. Ritterman. Ichthiologia (Sarajevo). Vol 1, No 1, p 19-25, 1969. Illus. English summary.  
Identifiers: Calomel treatment, Diet, Fish, Gall-bladder, Membrane, Mucus, "Octomitus-truttae, Parasit-drug, "Parasites, Ponds, Toxicity, "Trout, "Yugoslavia.

A parasitic disease, caused by flagelate, was identified. It caused heavy losses in raising young trout. Microscopic examination of fresh preparations from gall bladders and intestinal mucous membranes of the young trout revealed the parasites. Calomel treatment is effective, and some zoohygienic measures were undertaken. A special system of feeding was also used. Calomel treatment can provoke some toxic symptoms in young trout. By this system of treatment and feeding of young trout, the mortality was reduced to less than 1%.—Copyright 1972, Biological Abstracts, Inc.  
W73-08282

**NATIONAL ANIMAL FEEDLOT WASTES RESEARCH PROGRAM,**  
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Animal Feedlot Wastes Research Program.

L. R. Shuyler.  
Copy available from GPO Sup Doc as EPL23/2-73-157, \$0.75; microfiche from NTIS as PB-219 821, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-157, February 1973. 33 p, 3 fig, 2 tab, 15 ref. EPA Project 13040 GUJ.

Descriptors: "Feedlot, Animals, Wastes, Water quality control, Pollution abatement, Planning, Farm wastes, "Research priorities, Federal government, Project planning.  
Identifiers: "National research programs, "Animal feedlot wastes, Agricultural waste water.

The status of the National Animal Feedlot Wastes Research Program is presented. Current research projects and future program development are discussed. Research and investigations are needed to evaluate the effectiveness of potential treatment and control measures. Examples of such projects are presented. Demonstrations and educational activities will be required to provide widespread acceptance of new concepts. The future plans of the program are presented on a PERT diagram. The time frame for the PERT diagram is dependent on funding and may be adjusted slightly in the future. (EPA)  
W73-08286

**OIL SPILLS CONTROL MANUAL FOR FIRE DEPARTMENTS,**  
Alpine Geophysical Associates, Inc., Norwood, N.J.  
R. Cross, J. Cunningham, B. Katz, and A. Roberts. Copy available from GPO Sup Doc as EPL23/2-73-117, \$1.25; microfiche from NTIS as PB-219 884, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-117, February 1973. 98 p, 10 fig, 17 ref. EPA Project 15080 FVP. New York City Fire Department (Grantee).

Descriptors: Training, "Oil spills, "Oil pollution, "Harbors, "Inland waterways, Hydraulics, Jets, Piers, Docks, "Water pollution control, Pressure, Basins, Boats, Law enforcement, Nozzles, Local governments, Dispersion emulsions.  
Identifiers: Surface currents, Monitor streams, "Fire departments, Booming, Herding, Skimming, Sorbents, Oil spill containment boom, Emergency service, Boom terminal gap.

This report was developed from field tests and actual oil spill control experiences of the Marine Division of the New York Fire Department during a twenty-two month period beginning October 8, 1970. The information is intended to assist a community in protecting its area against oil spill damage. Operational procedures described are intended to serve as stop-gap measures, pending the inauguration of clean-up activities by the spiller or responsible Federal Agency. A survey of cities susceptible to oil spills indicates that most responding fire departments are concerned with containing spills as well as dealing with spill-created fire hazards. Research and development which culminated in the production of this manual concentrated on the utilization of existing fire department resources. However, a limited amount of useful ancillary equipment was procured or developed. Such equipment is described and its use is explained. The manual describes common sources of oil spills and some ecological effects of oil pollution. Pertinent Federal laws and regulations are outlined. Some feasible techniques for dealing with harbor spills are offered. (EPA)  
W73-08288

#### PROBLEMS OF COMBINED SEWER FACILITIES AND OVERFLOWS, 1967.

American Public Works Association, Chicago, Ill.

Federal Water Pollution Control Administration, Water Pollution Control Research Series WP-20-11, December 1, 1967. 183 p, 10 fig, 61 tab, 22 ref. EPA 11020-12/67, FWPCA Contract No. 14-12-65.

Descriptors: "Combined sewers, "Sewerage, "Water pollution, "Urban runoff, Costs, Data collections, Water pollution control, Overflow, Separated sewers, Sanitary engineering, Urban drainage, Water pollution sources, Sewers.  
Identifiers: "Combined sewer overflows.

A nationwide survey was made of the effects and means of correcting combined sewer overflows and storm and sanitary sewer discharges. Over 900 communities were surveyed by personal interviews of public officials, and the results were projected for the entire country. Many conclusions were reached and recommendations made on alleviating the problems of flooding and pollution from sewer systems. The communities surveyed did not have adequate information to evaluate the extent and effect of sewer overflows and that sewer overflows are a major part of this country's water pollution problems, contrary to what was previously thought. Separation of existing combined sewers was estimated to cost 48 billion dollars nationally, while alternative methods of control would cost only 15 billion dollars. Few communities were engaged in programs of complete separation of combined sewers. Although separation is the most popular method of control being used, it is usually applied to only a portion of the total sewer system. Additional research is recommended to develop new methods of control and/or treatment of combined sewer overflows as alternatives to sewer separation. Other recommendations were made on improving the knowledge of the frequency and effects of combined sewer overflows and design criteria for sewers to help solve the problems of flooding and overflows. (Poertner)  
W73-08299

**DESTRUCTION OF OIL SLICKS,**  
Halliburton Services, Duncan, Okla. (assignee). R. F. Rensvold.

U. S. Patent No. 3,705,782, 3 p, 4 ref; Official Gazette of the United States Patent Office, Vol 905, No 2, p 353, December 12, 1972.

Descriptors: "Patents, "Oil spills, "Oil pollution, Water quality control, "Pollution abatement.  
Identifiers: "Calcium carbide, Acetylene gas, Hydrocarbon gas.

Oil spills are destroyed by increasing the combustibility of the oil film by incorporating an ignitable and combustible gas such as a hydrocarbon gas or hydrogen gas and igniting it in the presence of atmospheric oxygen. The oil film will be converted to carbon dioxide and water and thereby destroyed. Finely divided particles of calcium carbide are deposited on the surface of the oil. The particles settle through the oil film, contact the water and generate acetylene gas. The product of the reaction between calcium carbide and water is calcium hydroxide. The hydroxide is eventually converted to calcium carbonate. The ignition of the oil-hydrocarbon gas mixture may be accomplished by a variety of means, such as floating flares dropped from aircraft, or incendiary projectiles fired from a floating vessel. (Sinha-OEIS)  
W73-08305

#### OIL REMOVAL DEVICE,

R. H. Cross, III.

U. S. Patent No. 3,706,382, 4 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 905, No 3, p 526, December 19, 1972.

Descriptors: "Patents, Skimming, "Oil spills, "Oil pollution, Water quality control, "Pollution abatement, Equipment, Separation techniques.

This device includes an H-shaped skimmer consisting of a cross member and two arm portions. Each arm is of rectangular or circular cross section and provides inflow ports. A flexible buoyant suction hose communicates through the structure with the inflow ports for the removal of oil. The skimmer may be suspended from a buoyant frame. The longest dimension of the device is not more than one-fourth the wavelength of the shortest waves whose amplitude might be significant in disturbing the device. (Sinha-OEIS)  
W73-08307

#### SKIMMERS FOR POLLUTION CONTROL DEVICE,

J. W. Harrington, and E. G. Milne.

U. S. Patent No. 3,707,232, 4 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 905, No 4, p 748, December 26, 1972.

Descriptors: "Patents, Skimming, "Oil spills, "Oil pollution, "Pollution abatement, Equipment, Water quality control.

This floating skimmer has a top part which can slide on an intake conduit and a bottom which can counteract the internal pressure drop normally incident to the intake operation. An upper cone has a horizontal flange and the lower float has a flat surface which extends slightly past the flange and is positioned close to the flange in normal use. The cone is free to move to achieve adjustment and float on the pollutant surface. Stops may be added on any point of proximity between the top member and the upper plate of the bottom member to maintain a minimum skimming aperture. It is preferred that the upper plate of the bottom member by moderately concave, so as to act somewhat as a small basin. Two variations in the configuration are presented. (Sinha-OEIS)  
W73-08309

#### ANTI-POLLUTION BALLAST CONTAINER, H. Liles.

U. S. Patent No. 3,707,937, 3 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 906, No 1, p 148, January 2, 1973.

Descriptors: "Patents, "Pollution abatement, Equipment, Water pollution control, Water quality control.

Identifiers: "Oil tankers, "Ballast containers.

The container is constructed with a surrounding wall having contraction rings secured at intervals.

## Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5G—Water Quality Control

The container collapses in folds that are guided by rings secured to the wall of the container intermediate of the folds. This allows the container to expand when ballast fluid is pumped into the container to provide the appropriate quantity of ballast weight within the compartment and yet to be discharged from the tanker without the ballast fluid being contaminated with the oil or causing pollution at the point of discharge. (Sinha-OEIS) W73-08313

**OIL SKIMMER,**  
Cities Service Oil Co., Tulsa, Okla. (assignee).  
E. A. Bell.  
U. S. Patent No. 3,708,070, 5 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 906, No 1, p 183, January 2, 1973.

Descriptors: \*Patents, Skimming, \*Oil spills, \*Oil pollution, Water quality control, \*Pollution abatement, Equipment, Separation techniques, Water pollution control.

Identifiers: \*Oil skimmers.

The oil skimming barge has a transition compartment arranged to receive inflow from the surface of the water over the rim of a pivoted floating baffle. Surface liquid inflow to the compartment is determined by the position of the baffle which in turn is determined by the outflow of water from the bottom of the downstream end of the compartment. At the downstream end of the last transition compartment there is an oil recovery compartment having a floating baffle inlet arrangement. Oil is withdrawn at a suitable rate to control the inlet baffle position. The inlet to the recovery compartment faces a downstream direction to render inflow to the recovery compartment substantially independent of perturbations in the liquid resulting from the overall surface flow. (Sinha-OEIS) W73-08314

**SYSTEM AND BARRIER FOR CONTAINING AN OIL SPILL,**  
Ocean Systems, Inc., Tarrytown, N.Y. (assignee).  
R. N. Blockwick.  
U. S. Patent No. 3,708,982, 5 p, 18 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 906, No 2, p 418, January 9, 1973.

Descriptors: \*Patents, \*Barriers, \*Oil spills, \*Oil pollution, Water pollution control, Water quality control, \*Pollution abatement, Equipment, Separation techniques.

Individual barrier modules are coupled end to end for confining a liquid such as oil floating on the surface of a body of water. The barrier module may form a closed loop about a tanker. The barrier may be moored if necessary. The upper section of each module extends above the surface of the water, and the lower section which reaches below the surface serves as ballast and subsurface barrier. They are bound by any water repellent sealing adhesive. Where a porous foam plastic material is used to form the upper section it may be rendered water impervious by sealing the outer periphery. Once immersed into water the mass of the water-absorbing lower section will immediately increase due to entrapped water, providing the necessary ballast. The lower section will exhibit a dynamic response characteristic closely simulating the surface characteristics of the sea itself. The lower section may be fabricated out of a reticulated polyether based polyurethane foam. (Sinha-OEIS) W73-08315

**APPARATUS FOR CONFINING OIL SPILLS,**  
W. E. Brown, and E. E. Gilbert.  
U. S. Patent No. 3,708,983, 4 p, 11 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 906, No 2, p 418, January 9, 1973.

Descriptors: \*Patents, Barriers, \*Oil spills, \*Oil pollution, Water pollution control, Water quality control, Equipment, Separation technique, \*Pollution abatement.

The apparatus comprises a series of elongated, hollow, structural units that are connected together to form a closed loop of any desired configuration. Each structural unit is air-tight except for inlet and outlet openings and each is connected to an air line that may be attached to a compressor. Valves on each unit may be actuated simultaneously to allow air to escape from and water to enter to units, causing them to flood and submerge the apparatus. When an oil spill or leakage is to be contained, the outlet valves can be closed and the inlet valves opened so that the compressor can supply air to raise the apparatus to the water surface. Barrier portions extending above and below the hollow air-filled units prevent waves from breaking over the apparatus and oil from passing under it. (Sinha-OEIS) W73-08316

#### APPARATUS FOR CONFINING A FLOATABLE LIQUID,

N. Matheson.  
U. S. Patent No 3,710,577, 4 p, 9 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 906, No 3, p 829, January 16, 1973.

Descriptors: \*Patents, Barriers, \*Oil spills, \*Oil pollution, \*Pollution abatement, Equipment, Water quality control, Water pollution control, Separation techniques.

This apparatus consists of floatable barrier sections, each comprising a flexible water impervious upright curtain. A pair of cables are secured to each curtain and extend longitudinally in spaced relationship one to the other. A pair of buoyant tubes are placed to control the center of buoyancy and develop corrective forces that maintain the barrier in a generally upright stable position. The apparatus has a towing assembly which consists of a pair of outboard buoyancy tanks and a towing bridle that stabilizes the floatable barrier and inhibits yaw, pitch and roll. The barrier can be arranged in a variety of configurations. (Sinha-OEIS) W73-08321

#### VARIABLE DISPLACEMENT FENCE FOR OIL SPILL CONTAINMENT AND RECOVERY,

W. M. Davidson, and H. W. Cole, Jr.  
U. S. Patent No 3,710,943, 4 p, 8 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 906, No 3, p 922, January 16, 1973.

Descriptors: \*Patents, \*Oil spills, Barriers, Separation techniques, Water pollution control, Water quality control, \*Pollution abatement, \*Oil pollution.

A barrier is provided that is responsive to mean wave height rather than to each wave in a heavy sea. This flexible, inflatable barrier is constructed in the form of a tunnel inside of which there is a continuous passage for oil that enters the barrier beneath the water's surface on the upstream side and leaves the barrier on either end of the tunnel. The barrier is weighted at the bottom by suitable ballast means and buoyed at the top by long, continuous air chambers. Lengthwise cables are attached along the top and bottom of the barrier for towing and control purposes. (Sinha-OEIS) W73-08322

#### FLOATING BARRAGE,

Pneumatiques, Cacutchouc Manufacture et Plastiques Kleber-Colombes (France).  
R. Durocq, and C. Moreau.  
U. S. Patent No 3,713,410, 3 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 906, No 5, p 1573, January 30, 1973.

Descriptors: \*Patents, \*Oil spills, \*Oil pollution, Separation techniques, \*Flotsam, Barriers, Water pollution control, Water quality control, \*Pollution abatement.

This barrier consists of sections each of which contains an inflatable bag with panels suspended from and tangent to it. The panels overlap each other over a portion of their length. The panels are connected so as to be able to swing relative to each other. The barrage formed by an assembly of barriers has a chain serving as traction means and as ballast extends underneath the barrage along its entire length. The barrage is able to follow the movements of the surface of seas and may be drawn into a variety of configurations. (Sinha-OEIS) W73-08323

**SYSTEMS FOR THE REMOVAL OF POLLUTANTS FROM WATER,**  
For primary bibliographic entry see Field 05D.  
W73-08329

**STANDARDS BASED ON THE QUALITY OF THE RECEIVING WATER,**  
Trent River Authority (England).  
W. F. Lester.  
Water Pollution Control, Vol 58, Part 3, p 324-332, 1969. 8 tab, 6 ref.

Descriptors: \*River regulation, \*Water quality standards, Water pollution control, Aeration, Water law, Regulation, Effluents.  
Identifiers: Royal commission river standards.

The Royal Commission established visible standards in 1911 for classifying rivers from 'very clean' to 'bad'. In order to establish standards based on the quality of the receiving water, many subtle factors beyond visual observation must be considered, such as reaeration rate, physical parameters, and biological use of the water. River standards have the disadvantage of requiring legislative revision. The advantage of river standards is that the river itself determines the quality of effluent that should be discharged to it. (Anderson-Texas) W73-08413

**THE EFFECT OF KRAFT PULP MILL EFFLUENTS ON THE GROWTH OF ZALERION MARITIMUM,**  
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.  
For primary bibliographic entry see Field 05C.  
W73-08426

**WATER POLLUTION IN SUEZ BAY,**  
Red Sea Inst. of Oceanography and Fisheries, Al Ghudaqah (Egypt).  
A. H. Meshal.  
Bull Inst Oceanogr Fish. 1: p 461-473. 1970. Illus. Map.  
Identifiers: Bays, \*Suez Bay, Water pollution treatment, \*Oil pollution, \*Pollution abatement.

Methods are suggested (and evaluated) for the treatment and disposal of floating oil. They are: covering with fibrous material, sinking with powdered solids, and dispersion with emulsifiers.—Copyright 1973, Biological Abstracts, Inc.  
W73-08432

**THREATENED FRESHWATER FISHES OF THE UNITED STATES,**  
Michigan Univ., Ann Arbor. Museum of Zoology.  
For primary bibliographic entry see Field 021.  
W73-08439

## WATER RESOURCES PLANNING—Field 06

### Techniques of Planning—Group 6A

#### 06. WATER RESOURCES PLANNING

##### 6A. Techniques of Planning

**INITIAL RESULTS FROM THE UPPER WABASH SIMULATION MODEL,**  
Purdue Univ., Lafayette, Ind. Water Resources Research Center.  
For primary bibliographic entry see Field 04A.  
W73-07815

**DEVELOPMENT OF A STATE WATER-PLANNING MODEL, FINAL REPORT,**  
Montana State Univ., Bozeman. Water Resources Research Center.  
D. W. Boyd, T. T. Williams, and R. L. Brustkern.  
Available from the National Technical Information Service as PB-219 363, \$3.00 in paper copy,  
\$1.45 in microfiche. Completion Report No. 36,  
1973. 19 p. OWR 8-029-MONT (5).

Descriptors: \*Planning, \*Mathematical models, \*Systems analysis, \*Montana, \*Model studies, State governments.

A water-planning model was developed for the Water Resources Division, Montana Department of Natural Resources and Conservation. The planning model is a management tool, intended to be used by the Water Resources Division to provide impersonal, accurate, speedy answers to water management questions such as 'what will be the effect on the river basin of diverting flow from a particular stream for a new thermal energy plant', or 'what changes in streamflow can be expected by constructing a new storage dam at a specified location.' Three levels of development of the model have been completed: state peripheral, basin peripheral, and sub-basin peripheral. The sub-basin model is the most comprehensive version, and provides the greatest amount of detail. The models are hydrologic; but the methodology can easily be extended to include water quality and economic data as well. (Holje-Montana)  
W73-07817

**MODELS OF INDUSTRIAL POLLUTION CONTROL IN URBAN PLANNING,**  
RAND Corp., Santa Monica, Calif.  
For primary bibliographic entry see Field 05G.  
W73-07831

**MANAGEMENT MODEL AS A TOOL FOR STUDYING THE WORTH OF DATA,**  
Geological Survey, Arlington, Va. Water Resources Div.  
T. Maddock, III.  
Water Resources Research, Vol 9, No 2, p 270-280, April 1973. 1 fig, 5 tab, 12 ref.

Descriptors: \*Mathematical models, \*Systems analysis, \*Water management (Applied), \*Farm management, Data processing, Data collections, Irrigation, Water utilization, Planning, Groundwater, Withdrawal, Water yield.  
Identifiers: \*Data evaluation.

Groundwater simulation modeling, mathematical programming, and decision theory may be combined to plan and manage an irrigated farm. The model accommodates variation in economic factors such as pumping costs and crop prices, in hydrologic factors such as transmissivity and storage coefficient, and in physical factors such as the choice of a physical model of the groundwater system. Those factors that are most critical to planning and managing the farm are identified and analyzed. The results of the analysis are a decision on cropping and pumping patterns over a design

period, a choice of a physical model of the groundwater system that meets the needs of the farm, a ranking of data by the worth to the farm, and a ranking of data by priority for further data collection activities. (Knapp-USGS)  
W73-07882

**OPTIMIZATION OF DEAD END WATER DISTRIBUTION SYSTEMS,**  
Roorkee Univ. (India). Dept. of Civil Engineering.  
For primary bibliographic entry see Field 04A.  
W73-07920

**INTEGRATING ALL ASPECTS OF REGIONAL WATER SYSTEMS,**  
British Columbia Univ., Vancouver. Water Resources Research Centre.  
I. K. Fox.  
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY4, Proceedings paper 9662, p 599-603, April, 1973. 5 p, 1 fig.

Descriptors: \*Water resources development, \*Systems analysis, \*Hydraulics, \*Economic analysis, \*Regional analysis, Social needs, Institutions, Systems, Water quality.  
Identifiers: \*Wisconsin River, Policies, Behavioral sciences, Cost minimization.

The natural scientist, the economist, and the engineer are concerned with providing better data and information for making decisions about water use, through utilization of water resources system analysis. The behavioral scientist, on the other hand, is concerned with providing information about how people and institutions interact in making water use decisions and how institutions may be altered to produce a different kind of decision. The conceptual and factual foundation utilized by the behavioral scientist has limitations similar to those of the natural scientist and the economist, and systems analysis makes best use of limited data while indicating the areas in which additional knowledge is most urgently needed. The advancement of systems analysis in the natural science, economic, and behavioral science areas, individually and separately, is highly worthwhile. However, a procedural integration of physical-biological subsystems, economic subsystems, and institutional subsystems is necessary for providing an improved foundation for policy and institutional design in water resources development. How such a procedure was followed in a case study of the Upper Wisconsin River is outlined, and the results of using the approach are discussed. (Bell-Cornell)  
W73-07921

**SYSTEMS APPROACH TO WATER QUALITY MANAGEMENT,**  
Water Resources Engineers, Inc., Walnut Creek, Calif.  
For primary bibliographic entry see Field 05B.  
W73-07922

**SYSTEMS ANALYSIS IN IRRIGATION AND DRAINAGE,**  
California Univ., Riverside. Dry-Lands Research Inst.  
For primary bibliographic entry see Field 03F.  
W73-07923

**STATUS OF WATER RESOURCE SYSTEMS ANALYSIS,**  
Texas Univ., Austin. Center for Research in Water Resources.  
L. R. Beard.  
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY4, Proceedings paper 9658, p 559-565, April, 1973. 7 p.

Descriptors: \*Water resources, \*Water management (Applied), \*Systems engineering, Hydraulics, \*Social needs, \*Environmental effects, Ecology, Stochastic processes, Simulation analysis, Optimization, Operations research, Mathematical models.

Although great progress has been made in simulating the physical operation of water resource systems, challenging problems still remain. Primarily, these are multi-objective evaluations of physical output and application of operations research techniques. Conflicting and complementary output functions, stochastic input functions, complex physical, legal and social constraints, and system nonlinearities pose great technical difficulties. Development of an optimum plan of water resources management requires the integration of objectives, such as economic efficiency, environmental protection, ecological management, and social well-being; necessarily, these objectives must be related in terms of a common denominator, or unique objective function. Effective application of operations research techniques, such as linear or dynamic programming, is hindered by the extreme complexity of water resource systems; nonlinearities and interrelationships that change with time and location make optimization particularly difficult. At present, a gradient type of optimization based on detailed system simulation is most useful. Needed is a more realistic and highly sophisticated systems simulation model, capable of accommodating systems of any configuration, inputs, and demand criteria, and containing a framework for operating the system that is sufficiently flexible to respond to all needs. Advances are most promising in the direction of analyzing internal interactions of water resource systems and their impacts on objective functions. (Bell-Cornell)  
W73-07924

**SYSTEMS APPROACH TO POWER PLANNING,**  
Bechtel Corp., San Francisco, Calif. Hydro and Community Facilities Div.  
For primary bibliographic entry see Field 08C.  
W73-07925

**EFFECT OF INCLUDING WATER PRICE ON THE CONJUNCTIVE OPERATION OF A SURFACE WATER AND GROUNDWATER SYSTEM,**  
Plan Organization, Tehran (Iran).  
For primary bibliographic entry see Field 04B.  
W73-08132

**OPTIMAL PATH OF INTERREGIONAL INVESTMENT AND ALLOCATION OF WATER,**  
Tel-Aviv Univ. (Israel). Dept. of Economics.  
U. Regev, and A. Schwartz.  
Water Resources Research, Vol 9, No 2, p 251-262, April, 1973. 2 fig, 42 equ, 17 ref.

Descriptors: \*Optimization, \*Water resources, \*Management, \*Economics, \*Water allocation (Policy), \*Investment, \*Regions, Seasonal, Water conveyance, Costs, Water storage, Flow, Mathematical models, Systems analysis, Equations.  
Identifiers: Shadow prices, Integer programming.

A deterministic model of the optimal allocation of water and investment in a system composed of several water regions is presented. A discrete time control theory is applied to formalize the model in which the main focus is upon the interaction of regional and seasonal considerations. Economic interpretation of the optimal conditions reveals the following price policy implications: Prices at two adjacent regions should differ by (at most) the cost of transportation. The general trend of the water inventory shadow price in present value is increasing over time with a decreasing rate, whereas the seasonal peaks and troughs in water demand produce positive and negative shifts from that

## Field 06—WATER RESOURCES PLANNING

### Group 6A—Techniques of Planning

trend and suggest a peak load-pricing system. The marginal productivity of water is related to rental prices of the different equipment types and to capital equipment marginal cost. The latter sets up an upper bound for water prices. Increasing returns to scale are treated by integer programming formulation when setup costs or indivisibility of projects violate the concavity of the objective function. (Bell-Cornell)  
W73-08133

**PROCEEDINGS OF THE WESTERN SNOW CONFERENCE,**  
For primary bibliographic entry see Field 02C.  
W73-08138

**COPING WITH POPULATION GROWTH AND A LIMITED RESOURCE,**  
Arizona Water Commission, Phoenix.  
P. Briggs.  
In: Proceedings of the 40th Annual Meeting of the Western Snow Conference, April 18-20, 1972, Phoenix, Ariz: Printed by Colorado State University, Fort Collins, p 6-8, 1972.

Descriptors: \*Systems analysis, \*Mathematical models, \*Water balance, Simulation analysis, Optimization, Water resources development, Water yield, Safe yield, Water management (Applied), \*Arizona.

A computerized systems analysis, using a series of optimization and simulation models, was used to prepare recommendations of water allocations in the State of Arizona. The system was divided into three subsystems: economic, hydrologic-engineering, and one which interfaces the first two. These fit together in a closed loop which can be continuously operated until all inputs are internally consistent. This method may be used to develop technical evaluations of specific areas for use by decision makers. (See also W73-08138) (Knapp-USGS)  
W73-08140

**REGIONALIZATION AND WATER QUALITY MANAGEMENT,**  
Camp, Dresser and McKee, Boston, Mass.  
For primary bibliographic entry see Field 05D.  
W73-08383

**MODELLING REGIONAL WASTE WATER TREATMENT SYSTEMS,**  
Michigan Univ., Ann Arbor. School of Public Health.  
For primary bibliographic entry see Field 05D.  
W73-08385

**SIMPLE ALGORITHM FOR COST OPTIMIZATION OF A THREE DECISION VARIABLE SYSTEM,**  
Wayne State Univ., Detroit, Mich. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 05D.  
W73-08386

### 6B. Evaluation Process

**A METHODOLOGY FOR PLANNING OPTIMAL REGIONAL WASTEWATER MANAGEMENT SYSTEMS,**  
Massachusetts Univ., Amherst. Water Resources Research Center.  
For primary bibliographic entry see Field 05D.  
W73-07805

**THE POLITICAL ECONOMY OF A CORPS OF ENGINEERS PROJECT REPORT: THE DELMARVA WATERWAY,**  
Cornell Univ., Ithaca, N.Y.

For primary bibliographic entry see Field 05E.  
W73-07811

**ECONOMIC BENEFITS FROM AN IMPROVEMENT IN WATER QUALITY,**  
Oregon Univ., Corvallis. Dept. of Agricultural Economics.  
For primary bibliographic entry see Field 05G.  
W73-07813

**THE MISSISSIPPI RIVER—A WATER SOURCE FOR TEXAS. (EVALUATION OF A PROPOSED WATER DIVERSION),**  
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.

R. G. Kazmann, and O. Arguello.  
Available from the National Technical Information Service as PB-219 362, \$3.00 in paper copy, \$1.45 in microfiche. Louisiana Water Resources Research Institute, Baton Rouge, Bulletin 9, March 1973. 183 p, 17 fig, 8 tab, 22 ref, 4 append. OWRR A-016-LA (2).

Descriptors: \*Diversion, \*River forecasting, \*Inter-basin transfers, Outlets, \*Water transfer, Water importing, Water costs, Economic feasibility, \*Saline water intrusion, Saline water-freshwater interfaces, Mathematical models, Louisiana, \*Mississippi River, Interstate, Regional economics.  
Identifiers: Texas Water Plan.  
W73-07813

Various rates of diversion to Texas were incorporated in computer playbacks of the daily Mississippi River discharges at Vicksburg for the period from 1928 to 1967, assuming that the Old River Control Structure also diverted 25 percent of the flow into the Atchafalaya River at the same time. The frequency of salt-water encroachment in the river at New Orleans (Algiers) during low water would not have changed if the minimum diversion rate to Texas had been 24,000 cfs for 8.5 months per year (annual quantity, 12 million acre-feet). Cost estimates include: construction of new reservoirs in Texas to store 15 million acre-feet for seasonal distribution; 12,000 megawatts of electric power to lift the water 4,000 feet. Total cost of irrigation water ranges from approximately \$70 to \$100 per acre-foot. Possible future projects in the Mississippi River basin, including proposed navigation improvements and reconstruction of the Old River Control Structure, would necessitate greater diversion rates for shorter periods of time, thus, increase water costs. A simple program forecasts the daily discharges at Vicksburg (up to 6 days) and New Orleans (up to 9 days) from daily readings at upstream gaging stations. The estimates are within 11% of recorded flows at least 80% of the time. Salt-water advance up the Mississippi can also be reliably predicted with a subroutine from either the actual or the forecast flows. (Hill-Louisiana)  
W73-07816

**REGIONAL WATER RESOURCE PLANNING FOR URBAN NEEDS: PART I,**  
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.

D. H. Moreau, K. Elfers, G. S. Nicolson, and K. Takeuchi.

Available from the National Technical Information Service as PB-219 364, \$3.00 in paper copy, \$1.45 in microfiche. North Carolina Water Resources Research Institute Report No. 77, March 1973. 159 p, 16 fig, 14 tab, 81 ref. OWRR B-021-NC (2) and B-045-NC (1). 14-31-0001-3313, 14-31-0001-3624.

Descriptors: \*Water resources, \*Planning, \*Alternative planning, \*Water supply, \*Water pollution control, Urbanization, \*Regional analysis, Regional development, North Carolina.  
Identifiers: \*Urban water resources, Piedmont Triad Region (N.C.).

Objectives of study are three-fold: (1) to demonstrate need for regional water resource planning in emerging urban areas; (2) to examine how regional water resource planning can be realized within the emerging organizational framework of Federal, State, regional, and local planning; and (3) to examine the process, substance, and techniques of field level planning for regional water resource systems. Analysis of present river basin planning and development indicates that problems of urban areas and linkages with river basins have been largely ignored. Bias results from the traditional emphasis on national economic development in formulation of basin plans. Design of municipal water supply and waste disposal systems have been largely single purpose and fractionated with respect to the water resources. Opportunities to achieve economies and resolve externalities through regional planning and management have been ignored. Recent initiatives by Federal and State governments have created an organizational framework within which deficiencies in these two processes can be resolved. A water resource planning model and a planning system that can operate within this framework is suggested, but the fragile political basis upon which that framework is founded requires that State and Federal agencies must reinforce the process if it is to resolve the problems of urbanizing regions. The substance of regional water resource planning is examined using a case study of the Piedmont Triad Region of North Carolina.  
W73-07819

**LOCAL ECONOMIC IMPACT OF RESERVOIR RECREATION,**  
Tennessee Univ., Knoxville. Water Resources Research Center.

C. B. Garrison.  
Available from the National Technical Information Service as PB-219 585, \$3.00 in paper copy, \$1.45 in microfiche. Research Report No. 27, July 1972. 37 p, 15 tab. OWRR A-020-TENN (2). 14-31-0001-3545.

Descriptors: \*Economic impact, Rural areas, \*Reservoirs, \*Tennessee, Water resources development, \*Recreation.  
Identifiers: \*Norris Reservoir (Tenn), \*New Johnsonville (Tenn).

Reservoir recreation affects the economy of the local area and also the larger region in which the reservoir is located. This study estimates the local economic impact of recreation activities at Norris Lake on a three-county rural area of East Tennessee. The impact consists of the primary and secondary effects. The primary effect is determined by estimating the employment and payroll of enterprises which sell goods and services to visitors. Estimation of the secondary effect requires the construction of local income and employment multipliers; these are estimated by the use of economic base theory. The economic effects of reservoir recreation are compared with those due to the establishment of a concentration of water-oriented manufacturing industry at New Johnsonville in West Tennessee.  
W73-07820

**ECONOMIC ASPECTS OF POLLUTION CONTROL,**  
University of New England, Armidale (Australia).  
For primary bibliographic entry see Field 05G.  
W73-07823

**ALTERNATIVE FINANCING FOR STATE AND LOCAL WATER RESOURCES PROJECTS,**  
Clemson Univ., S.C. Dept. of Economics.  
For primary bibliographic entry see Field 06C.  
W73-07825

## WATER RESOURCES PLANNING—Field 06

### Evaluation Process—Group 6B

**AN ECONOMIC APPROACH TO LAND AND WATER RESOURCE MANAGEMENT: A REPORT ON THE PUGET SOUND STUDY,**  
Washington Univ., Seattle. Dept. of Economics.  
R. L. Bish.

Washington University Institute for Economic Research Report, April, 1972. 19 p. append.

Descriptors: \*Water resources development, \*Management, \*Decision making, Water utilization, Land use, Evaluation, \*Washington.

Identifiers: \*Conflicts, Interdisciplinary study, \*Puget Sound (Wash.).

An interdisciplinary study of Washington's Puget Sound, which emphasizes the decision-making process for land and water use, is described. Initially, the study undertakes to describe the physical, biological, and zoological characteristics of the Sound, its economic uses, and the existing political and legal structure. Next, a detailed study of land and water use decision-making was undertaken with two successive goals in mind: (1) to develop the capacity to predict and evaluate consequences likely to flow from alternative political and legal structures, and (2) as a result, to evaluate the alternative political and legal structures themselves. The basic assumptions underlying the study's theoretical structure are identical with those of traditional microeconomics. However, unlike much traditional analysis, such matters as government organization, specification and enforcement of property rights, regulation of markets, regulation of many aspects of production and consumption, and governmental provision of goods and services directly to citizens are treated as subjects for analysis rather than as assumptions of the model. Application of the theory involves (1) four case studies of conflict in making decisions concerning land and water use, (2) projections of demand for water and land use, and (3) analysis of interaction and conflict among uses. (Settle-Wisconsin)

W73-07826

**EPA ASSESSES POLLUTION CONTROL BENEFITS.**  
For primary bibliographic entry see Field 05G.

W73-07829

**A REGIONAL PLANNING MODEL FOR WATER QUALITY CONTROL,**  
Virginia Polytechnic Inst. and State Univ., Blacksburg.  
For primary bibliographic entry see Field 05B.  
W73-07918

**THE FINANCIAL FEASIBILITY OF REGIONALIZATION,**  
Arkansas Univ., Fayetteville. Dept. of Agricultural Economics and Rural Sociology.  
For primary bibliographic entry see Field 03D.  
W73-07919

**STATUS OF WATER RESOURCE SYSTEMS ANALYSIS,**  
Texas Univ., Austin. Center for Research in Water Resources.  
For primary bibliographic entry see Field 06A.  
W73-07924

**SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES. EXPECTATION OF LIFE IN INDIANA, 1950-1970,**  
Purdue Univ., Lafayette, Ind. Dept. of Sociology and Anthropology.  
E. R. Cooper, L. Z. Breen, and H. R. Potter.

Available from the National Technical Information Service as PB-219 978, \$4.50 paper copy, \$1.45 in microfiche. Indiana Water Resources Research Center, Lafayette, Technical Report No

29, January, 1973; 50 p, 1 fig, 19 tab, 28 ref, append. OWRR C-3277 (3713)(1).

Descriptors: \*Population, \*Human population, \*Mortality, \*Urbanization, Fecundity, Migration, Aging, Urban sociology, Water resources development, Income distribution, Water consumption, Water utilization, \*Indiana.

Identifiers: \*Life expectation, Survival ratios, Lafayette.

Water consumption in a given region is dependent upon variables such as the rate of urbanization, population size, age composition, income, industrial development, recreation opportunities, etc. Estimates of future populations depend upon the calculation of age specific survival ratios for the present population. Mortality is the one stable component in population change, thus the careful calculation of present life tables provides the prerequisite for the development of reliable population projections from a basis of accurate survival ratios. The life tables developed for this research represents a series of probability statements. The data are based upon intervals of observation through the study period, 1950-1970. The reported measures of expectation of life at various ages are presented for the economic regions of Indiana, and like other life tables, are based upon the assumption that age-specific will remain the same in future years as was recorded during the observed periods. The populations in the regions are relatively small, thus the observed mortality rates may not be stable. It is emphasized that change in these rates will result in estimations of expectation of life which are different from those calculated in the study. The study is a part of an interdisciplinary project entitled "Systematic Development of Methodologies in Planning Urban Water Resources for Medium Size Communities." W73-07964

**THE DEVELOPMENT PLAN FOR HARRISTOWN TOWNSHIP, MACON COUNTY, ILLINOIS.**  
Macon County Regional Plan Commission, Decatur, Ill.

Available from the National Technical Information Service as PB-210 974, \$9.35 in paper copy, \$1.45 in microfiche. Final Report, February 1972. 143 p, 2 fig, 17 maps, 3 tab. Ill-1-291.

Descriptors: \*Land use plan, \*Comprehensive planning, \*Urban land use, Urbanization, Utilities, Drainage, \*Illinois.

Identifiers: Utility extension, Decatur (Ill), Implementation program, Macon County (Ill).

A comprehensive land use plan for Harristown township including several elements such as open space, transportation, commercial, industrial and residential land and a discussion of utilities extension are presented. Discussed are: (1) inventory and analysis including a discussion of land capabilities for various land uses; (2) growth objectives and the consequences of uncontrolled growth; (3) the proposed land use plan including several maps and policy statements; (4) and the means for implementing the plan. The discussions of utility services, i.e. water supply, sanitary sewers, and the storm sewers, are a minor element of the study, although the extension of these services is a key feature of the implementation of the overall land use plan. In general, the study proposes that the city of Decatur and the Decatur Sanitary District be responsible for extending the services into the township. It is also proposed that censuses and drainage ordinances be used to protect the natural drainage ways. (Ellers-North Carolina) W73-08052

**SHORELINE MANAGEMENT PLAN FOR THE ESCAMBIA-SANTA ROSA REGION.**  
Smith (Milo) and Associates, Tampa, Fla.

Available from the National Technical Information Service as PB-212 438, \$12.00 in paper copy, \$1.45 in microfiche. Final Report, prepared for Escambia-Santa Rosa Regional Planning Council, Pensacola, Florida. June 1972, 197 p, 25 fig. Fla-P-141.

Descriptors: \*Shoreline, \*Urbanization, \*Planning, \*Environmental effects, Design criteria, Management, Coordination, Beaches, Land use, \*Florida.

Identifiers: \*Shoreline management, Escambia-Santa Rosa Region (Florida), Escambia County (Florida), Santa Rosa County (Florida).

This shoreline management plan is comprehensive study and set of policies and recommendations for the use of the coastal zone around Pensacola, Florida. The study includes sections on the existing urban development patterns, the environmental impacts of these patterns and land uses, and an inventory of physiographic and hydrologic features. The most significant sections include: (1) a discussion of the basic philosophy of shoreline development and the objectives involved; (2) an analysis of potential design concepts and elements for shoreline development, including a morphological approach and an ecological approach; (3) a shoreline utilization plan featuring numerous development policies, standards, and implementation strategies; (4) and a shoreline management program involving protection programs, land use controls, monitoring, coordination of local agencies by the Regional Planning Council, environmental impact statements, and the creation of a special Shoreline Management Committee. Numerous maps and charts are included. (Ellers-North Carolina) W73-08053

**THE INTENSITY OF DEVELOPMENT ALONG SMALL AND MEDIUM SIZED STREAMS IN SUBURBAN PHILADELPHIA,**  
Regional Science Research Inst., Philadelphia, Pa. For primary bibliographic entry see Field 03D.  
W73-08055

**FUNCTIONAL PLANNING AND PROGRAMMING: HOUSING, WATER AND SEWER, RECREATION, LAND USE, ADMINISTRATION.**  
Mark Twain Regional Planning Commission, Macon, Mo.

Available from the National Technical Information Service as PB-211 603, \$11.50 in paper copy, \$1.45 in microfiche. Report, June 1972. 180 p. Mo. P. 195 SA/145.

Descriptors: \*Planning, \*Projects, Water supply, Sewage systems, Priorities, \*Missouri.  
Identifiers: Citizens Advisory Committee, Mark Twain Region (Missouri), Macon (Missouri).

A water and sewer report is one section of this functionally-oriented planning study for the eight county Mark Twain region in Missouri. The water and sewer section is a summary of two consultant studies of water and sewer needs in the region and of a citizens advisory committee's review of the two studies. The water and sewer needs are outlined according to cities with no public water systems, cities that need additional water supplies, cities that need water treatment improvements and storage improvements, and cities that need sewer systems. These needs are accompanied by some short descriptions and recommendations. Every need or proposed project is then rated as to its priority on the basis of the citizens advisory committee review. (Ellers-North Carolina) W73-08056

**OPTIMAL PATH OF INTERREGIONAL INVESTMENT AND ALLOCATION OF WATER,**  
Tel-Aviv Univ. (Israel). Dept. of Economics.  
For primary bibliographic entry see Field 06A.

## Field 06—WATER RESOURCES PLANNING

### Group 6B—Evaluation Process

W73-08133

**WATER SUPPLY PLANNING STUDY OF THE CAPITOL REGION OF CONNECTICUT,**  
Connecticut Univ., Storrs. Dept. of Civil Engineering.  
P. Magyar, P. Renn, A. Shahane, and D. Wall.  
Report No. CE-72-57, October 1972. 156 p., 6 fig., 35 tab., 29 ref., 3 append. OWRR A-999-CONN (11).

Descriptors: \*Water supply development, \*Water demand, \*Regional analysis, \*Human population, Urbanization, Environmental effects, Social aspects, Economics, Connecticut River, Water reuse, Evaluation, \*Connecticut.  
Identifiers: \*Optimum population, Ethical issues, \*Capitol Region (Conn.).

This study of water supply schemes for the Capitol Region of Connecticut projected population considering traditional engineering methodologies and ethical points raised by sociologists and demographers. An effort was made to quantify the qualitative concept of ethical issues to arrive at 'optimum population' for the Capitol Region. Total water demand was estimated for the years 1980, 2000, and 2020. To meet the projected demand of 250 MGD, alternative sources, including existing sources, new upland surface sources, the Connecticut River, Quabbin Reservoir and recycling were considered. These combined sources constitute viable alternatives to be evaluated on some rational basis. In the past, benefit-cost analysis has been used. However, public concern called for consideration of social, economic and environmental factors. Since it is relatively difficult to convert these qualitative factors into dollar terms, methods other than benefit-cost analysis were used to put value judgment on these alternatives. Literature review revealed two useful methods for this purpose: the Mason-Moore method, and the weighing factors method adopted by the Connecticut Region Planning Agency. After individual evaluations utilizing these methods, use of the Connecticut River rather than use of new upland sources (reservoirs) was chosen as the recommended alternative. (Edelen-Connecticut)  
W73-08382

**ORBITAL SURVEYS AND STATE RESOURCE MANAGEMENT,**  
Battelle Columbus Labs., Ohio. Aerospace Mechanics Div.  
For primary bibliographic entry see Field 07B.  
W73-08364

**SIMPLE ALGORITHM FOR COST OPTIMIZATION OF A THREE DECISION VARIABLE SYSTEM,**  
Wayne State Univ., Detroit, Mich. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 05D.  
W73-08386

**THE ECONOMICS OF WATER TRANSFER,**  
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.  
C. Gopalakrishnan.  
In: Water Resources Seminar Series No 2, Water Resources Research Center, University of Hawaii, Honolulu, December 1972. 11 p., 2 fig., 1 tab., 12 ref.

Descriptors: \*Economics, \*Water transfer, Water resources development, \*Resource allocation, \*Welfare (Economics), Water demand, Prices, Water rights, Optimum development plans.

The economics of water transfer is an aspect of water resource development that has at present generated considerable interest among economists. It deals with the economic implication of transferring water from low-yielding, conven-

tional uses (mainly agricultural) to newly-emerging and more productive uses (industrial and recreational) with a view to enhance the value and productivity of water. The limited supply of water in relation to the fast-expanding demand for it makes this type of transfer almost imperative for the optimum utilization of water resources. The tools of microeconomics and welfare economics are used to study the economic underpinnings of a process of water transfer. To understand the nature of the market for water and the allocation of water among multiple uses, a discussion of the theoretical principles underlying resource allocation is included, examining the concepts of proportionality embodied in the law of variable proportions and the equi-marginal principle. Also examined rather closely are the market for water rights and the problem of pricing water. The three principal characteristics of water development which enable direct application of welfare economics to water resources are described. See also W73-05857 (Bell-Cornell)  
W73-08387

### 6C. Cost Allocation, Cost Sharing, Pricing/Repayment

**ECONOMIC EVALUATION OF ALTERNATIVE FARM WATER SOURCES IN THE CLAYPAN AREA OF ILLINOIS,**  
Illinois Univ., Urbana. Dept. of Agricultural Economics.  
For primary bibliographic entry see Field 05G.  
W73-07804

**DISCHARGES OF INDUSTRIAL WASTE TO MUNICIPAL SEWER SYSTEMS,**  
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.  
For primary bibliographic entry see Field 05D.  
W73-07810

**SYSTEMS ENGINEERING OF OYSTER PRODUCTION,**  
Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.  
F. A. Costello, and B. L. Marsh.

Available from the National Technical Information Service as COM-72-10698, \$3.00 in paper copy, \$1.45 in microfiche. College of Marine Studies Publication No 2 EN 066, May, 1972. 55 p., 2 tab, append. Sea Grant No. GH-109.

Descriptors: \*Oysters, \*Systems analysis, Optimization, Costs, Mathematical models.  
Identifiers: \*Oyster production, \*Uncertainty, \*Systems engineering, Marine products.

A stochastic optimization model for a closed-environment oyster production facility is developed. Three types of stochastic uncertainty important to the oyster production system are analyzed: (1) uncertainty in primary system process parameters such as the effect of cell concentration on oyster growth; (2) uncertainty in design variables such as the heat exchanger outlet temperature; and (3) uncertainty in subsystem process functional relations such as algae growth rate versus illumination. The approach used to study the stochastic parameters model is to first develop analytical or empirical distribution functions for the stochastic parameters and then to obtain an expected cost which is a function of deterministic parameters and design variables only. Addition of stochastic design variables to the model requires not only that the distributions for these variables be determined, but also that the distribution for the system cost function be obtained in order to apply the expected value criterion or some other similar objective.

The addition of function uncertainty is accomplished through a systems analysis and cost sensitivity approach. The study indicates that algae production rate and cell concentration are of

major importance, while illumination intensity and deep tank air requirements are of secondary importance. Other variables affect costs insignificantly. (Settle-Wisconsin)  
W73-07824

**ALTERNATIVE FINANCING FOR STATE AND LOCAL WATER RESOURCES PROJECTS,**  
Clemson Univ., S.C. Dept. of Economics.  
A. H. Barnett.

South Carolina Water Resources Research Institute, Special Report, November, 1971. 45 p., 6 tab, 13 ref. OWRR B-030-SC (3).

Descriptors: \*Water resources development, \*Financing, \*Economic efficiency, \*Equity, Evaluation, Local governments, State governments, Federal government, Pollution taxes (Charges), Bond issues.  
Identifiers: User fees.

The criteria of economic efficiency and equity are employed in evaluating various approaches to state financing of local water supply and waste treatment facilities. One approach to such financing is to establish a state fund to be used for grants to local governments. The fund itself could be financed through water use fees or effluent charges. Other alternatives are state general obligation bonds, state bonds financed by local user charges on those receiving the services of the various projects, state loans to municipalities provided so as to meet federal requirements for increased federal aid, and local contributions to a state fund used to provide matching grants to contributing municipalities. The evaluation suggests that any state water resource fund would be difficult to justify. A system requiring benefit taxation or payments would be preferable. In fact, state aid for water projects other than waste treatment seems unjustified except under the unusual conditions where a project's benefits extended state-wide. Given the need to obtain federal aid, it seems that revenue bonds, applicant contributions, and loans to local government provide the most efficient and equitable alternatives. In any case, state sanctions are required to achieve desired water quality. (Settle-Wisconsin)  
W73-07825

**AN ECONOMIC APPROACH TO LAND AND WATER RESOURCE MANAGEMENT: A REPORT ON THE PUGET SOUND STUDY,**  
Washington Univ., Seattle. Dept. of Economics.  
For primary bibliographic entry see Field 06B.  
W73-07826

**A PRESENT VALUE-UNIT COST METHODOLOGY FOR EVALUATING WASTE-WATER RECLAMATION AND DIRECT REUSE AT A MILITARY BASE OF OPERATION,**  
Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.  
For primary bibliographic entry see Field 05D.  
W73-07838

**THE FINANCIAL FEASIBILITY OF REGIONALIZATION,**  
Arkansas Univ., Fayetteville. Dept. of Agricultural Economics and Rural Sociology.  
For primary bibliographic entry see Field 03D.  
W73-07919

**TERTIARY EFFLUENT DEMINERALISATION,**  
Permit Co. Ltd., London (England).  
For primary bibliographic entry see Field 05D.  
W73-08097

**COST REDUCTION IN SULFATE PULP BLEACH PLANT DESIGN,**  
Improved Machinery, Inc., Nashua, N.H.  
For primary bibliographic entry see Field 05D.

## WATER RESOURCES PLANNING—Field 06

### Water Demand—Group 6D

W73-08105

**ENGINEERING REPORT ON SHORE DISPOSAL OF SHIP GENERATED SEWAGE AT ACTIVITIES IN THE EASTERN AREA.**  
VOLUME I  
Reynolds, Smith and Hills, Jacksonville, Fla.  
For primary bibliographic entry see Field 05D.  
W73-08112

**EFFECT OF INCLUDING WATER PRICE ON THE CONJUNCTIVE OPERATION OF A SURFACE WATER AND GROUNDWATER SYSTEM.**  
Plan Organization, Tehran (Iran).  
For primary bibliographic entry see Field 04B.  
W73-08132

**THE ECONOMICS OF WATER TRANSFER,**  
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.  
For primary bibliographic entry see Field 06B.  
W73-08387

#### 6D. Water Demand

**THE MISSISSIPPI RIVER—A WATER SOURCE FOR TEXAS. (EVALUATION OF A PROPOSED WATER DIVERSION),**  
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 06B.  
W73-07816

**SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES. EXPECTATION OF LIFE IN INDIANA, 1950-1970,**  
Purdue Univ., Lafayette, Ind. Dept. of Sociology and Anthropology.  
For primary bibliographic entry see Field 06B.  
W73-07964

**FUNCTIONAL PLANNING AND PROGRAMMING: HOUSING, WATER AND SEWER, RECREATION, LAND USE, ADMINISTRATION.**  
Mark Twain Regional Planning Commission, Macon, Mo.  
For primary bibliographic entry see Field 06B.  
W73-08056

**WATER OF SIBERIAN RIVERS FOR ARID LANDS OF THE SOUTH (VODA SIBIRSKIKH RKK—ZASUSHIVYEM ZEMLYAM YUGA),**  
For primary bibliographic entry see Field 04A.  
W73-08162

**REGIONAL WATER AND SEWER GUIDE.**  
Upper Savannah Planning and Development District, Greenwood, S.C.

Available from the National Technical Information Service as PB-210 905, \$3.00 in paper copy, \$1.45 in microfiche. June 1972. 76 p, 7 fig, 21 tab, 21 ref.

Descriptors: \*Sewers, \*Water supply, \*Forecasting, Land use, South Carolina, Regional development, Water demand, Sewage districts, Water resources, Water resources development.  
Identifiers: \*Upper Savannah Region.

Present and future requirements are presented for water and sewer facility needs in the six-county region for which the Upper Savannah Regional Planning and Development Council has responsibility. The counties are Abbeyville, Edgefield,

Greenwood, Laurens, McCormick, and Saluda. Information has been compiled and analyzed in areas of: (1) land use, (2) populations, (3) economics, (4) geography, and (5) existing utilities. With a 1970 population of 159,000 that is expected to grow to 192,000 by 1990, the already inadequate sewer and water services in this region will become even more inadequate as water use rises from 27 mgd to 35 mgd. A major problem in providing these services is the rural nature of the area—more than 80 percent of the land is classified as agricultural or open space. Lack of coordination and political boundaries have also made it difficult to develop adequate facilities. Recommendations include: (1) regionalization of services to provide coordinated, cooperative facilities, (2) planning of future development of systems to control land use, preventing unwanted growth through denial of sewers and water and (3) continuation of the Upper Savannah Regional Planning and Development Council as the areawide planning organization for the six counties. (Poertner)  
W73-08177

**WATER, SEWER AND STORM DRAINAGE PLAN FOR THE CUMBERLAND PLATEAU PLANNING DISTRICT.**  
Thompson and Litton, Inc., Wise, Va.

Cumberland Plateau Planning District Commission, Lebanon, Virginia, June 6, 1972. 113 p, 5 tab.

Descriptors: \*Planning, \*Data collections, \*Drainage programs, \*Water supply development, \*Sewerage, \*Virginia, Storm runoff, Storm drains, Water resources, Regional analysis, Public utility districts, Water pollution control, Waste water treatment, Water works, Surveys.  
Identifiers: \*Cumberland Plateau.

The future development of the Cumberland Plateau Planning District, as well as the present level of development, requires adequate systems of water, sewerage and storm water drainage. Future development can be controlled by the development of these systems to produce growth consistent with the land-use policy of the area, but present development must not be denied adequate facilities even if it doesn't fit into the master plan. As a first step towards providing these services, this report presents a complete inventory of water, sewer and storm drainage in the area, pointing out deficiencies and recommending measures for correcting these short-comings. Each of the four counties comprising the study area has water supply problems. The most severe problems exist in Buchanan and Dickinson Counties where many areas either have no central water systems or inadequate systems. The proposed solution is the development of the John W. Flannagan Reservoir in Dickinson County to provide water for both counties. Similarly, sewerage problems exist. Using a set of criteria, projects have been rated. Those with the highest priority were recommended by the State Water Control Board for Federal and State construction grants. Development of a plan for storm water drainage is still in preliminary stages. (Poertner)  
W73-08179

**WATER AND SEWER PLAN.**  
West Alabama Planning and Development Council, Tuscaloosa.

Available from the National Technical Information Service as PB-210 955, \$12.50 in paper copy, \$1.45 in microfiche. May 1972. 161 p, 30 fig, 10 tab. CPA-AL-04-09-1008.

Descriptors: \*Planning, \*Regional analysis, \*Water resources development, \*Water supply, \*Sewerage, \*Surveys, Data collections, Long-term planning, Administration, Regional development, Water pollution control, Alabama, Forecasting, Public utility districts, Land use, Short-term planning.

The West Alabama Planning and Development Council serves five counties with a total area of 4,154 square miles and a population of 180,000, of which about 120,000 live in one county. Included in the report are: (1) the goals and policies for water and sewer system management, (2) an inventory of existing facilities, (3) an evaluation of these systems, (4) a short range (10 year) plan for water and sewers to meet present and future deficiencies, and (5) a long range (20 year) regional plan. The goals of the region are threefold: (1) to promote a co-ordinated regional approach to sewer and water, (2) to provide adequate water and sewer service to all area residents, and (3) to maximize the use of existing water resources including ground water, surface water and reclaimed waste water. Although population is not expected to change much in the next 20 years, increasingly stringent federal standards will require system upgrading, especially for sewer systems. But a higher priority is generally to be assigned for water systems, than for sewer systems, and all improvements should provide maximum service at a minimum cost. County level water systems are recommended with the Council acting as a regional coordinator. An areawide sewer system is seen as unfeasible but sewers are recommended for all incorporated areas, with funding from outside sources. (Poertner)  
W73-08181

**REGIONAL WATER AND SEWER FACILITIES IMPROVEMENT PROGRAM.**  
Southeastern Illinois Regional Planning and Development Commission, Harrisburg.

Available from the National Technical Information Service as PB-210 108, \$4.65 in paper copy, \$1.45 in microfiche. February 1972. 23 p, 4 tab. HUD III. P-307 (1-16).

Descriptors: \*Water resources, \*Regional analysis, \*Sewerage, \*Water supply, \*Illinois, \*Planning, Project planning, Project purposes, Evaluation, Water pollution control, Short-term planning.  
Identifiers: \*Southeastern Illinois.

A previous study (see W72-00643) of this rural, five-county region in southeastern Illinois pointed out extensive municipal water and sewage deficiencies. Strategies are presented of the Southeastern Illinois Regional Planning and Development Commission in overcoming these deficiencies. Criteria for individual projects include: (1) regional economic impact, (2) environmental impact, (3) health factors, (4) public safety factors, (5) size of population served, (6) consistency with regional plans, (7) readiness to proceed and (8) a crisis factor, which rates the project on its need for prevention of a potential catastrophe or to meet state regulations. The Commission has set goals for five one-year phases including the provision of technical assistance to the 7 highest priority projects. Funding is expected to be through utility rates and federal funding, with the Commission serving as the State-appointed clearinghouse for federal funds. The use of bonds is not expected to be required. The Commission also intends to establish a citizen advisory board to deal with all environmental issues in the region. (Poertner)  
W73-08184

**WATER SUPPLY PLANNING STUDY OF THE CAPITOL REGION OF CONNECTICUT.**  
Connecticut Univ., Storrs. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 06B.  
W73-08302

## Field 06—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

#### 6E. Water Law and Institutions

##### INTERGOVERNMENTAL RELATIONS AND RESPONSES TO WATER PROBLEMS IN FLORIDA, Florida Atlantic Univ., Boca Raton, Dept. of Political Science.

R. D. Thomas.

Available from the National Technical Information Service as PB-219 582, \$3.00 in paper copy, \$1.45 in microfiche. Florida Water Resources Research Center Publication No. 19, 1972. 48 p, 20 tab, 2 append. OWRR A-020-FLA (2). 14-31-0001-3809.

Descriptors: \*Govermental interrelations, \*Water resources, \*Florida, \*Attitudes, Water resources development, Water utilization, \*State governments.

An exploratory analysis is presented of Florida's legislators' and county commissioners' images (perceptions and attitudes): (1) of eleven selected water problems; (2) of which level or levels of government should have the responsibility for handling and attempting to solve these problems; (3) of the effectiveness of ten selected measures for dealing with water use problems; and (4) of the related factor of growth and development. The data, derived principally from interviews with the legislators and commissioners, showed a basic difference between the legislators and commissioners in their assessment of the severity of water problems; in their assessment of the severity of water problems relative to other public problems such as education, welfare, roads, and health/hospitals; and, in their evaluation of the need to impose controls on growth and development. On the other hand, the data showed considerable agreement between the legislators and commissioners in their evaluation of what solutions would be most effective in dealing with water use problems. (Morgan-Florida)  
W73-07803

##### THE POLITICAL ECONOMY OF A CORPS OF ENGINEERS PROJECT REPORT: THE DELMARVA WATERWAY, Cornell Univ., Ithaca, N.Y.

L. A. Shabman, P. Willing, D. S. Allee, S. P. Lathrop, and C. Riordan.

Available from the National Technical Information Service as PB-219 403, \$3.00 in paper copy, \$1.45 in microfiche. New York Water Resources and Marine Sciences Center, Ithaca, Technical Report No. 43, A.E. Res. 72-9, June 1972. 59 p, 1 fig, 4 tab, 35 ref. c-2199; OWRR B-026-NY (3). 14-31-0001-3312; 14-31-0001-3409.

Descriptors: \*Decision making, \*Planning, Projects, \*Delaware, \*Maryland, \*Virginia, Economics, Political aspects, Federal Government, State governments, Economic analysis, Economic efficiency, Estuaries, Ecosystems, Resources, Cost-benefit ratio.

Identifiers: \*Delmarva Waterway, \*Information flow, Local interests, Leverage.

A first step in correcting inadequacies in institutional arrangements is to understand such arrangements as they now function. The sequence of events and the system that produced a U.S. Army Corps of Engineers navigation project report are examined. Its orientation is that of seeking rather than solving problems, though some tentative conclusions and suggestions for change are offered. Specific reference is made to the process which led to the Congressional authorization of a waterway on the eastern shore of the Delmarva Peninsula in Delaware, Maryland, and Virginia. The method used to carry out the study involves three related procedures: (1) interviews with principals in the decision-making process and with local people; (2) maintenance of correspondence and memoranda files, studied intensively; and (3) sort-

ing of the resulting data and compiling it according to a framework of theoretical organizing concepts which help illuminate the characteristics of information flow and use in the decision-making process. Information is vital to decision-making, with the result that the content of and power behind information flows largely determine the outcome of the planning process. (Bell-Cornell)  
W73-07811

##### AN APPRAISAL OF FLOODPLAIN REGULATIONS IN THE STATES OF ILLINOIS, INDIANA, IOWA, MISSOURI, AND OHIO, Illinois Univ., Urbana, Dept. of Landscape Architecture.

For primary bibliographic entry see Field 06F.  
W73-07814

##### REGIONAL WATER RESOURCE PLANNING FOR URBAN NEEDS: PART 1, North Carolina Univ., Chapel Hill, Dept. of City and Regional Planning.

For primary bibliographic entry see Field 06B.  
W73-07819

##### UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA, Minnesota Univ., Minneapolis, Water Resources Research Center.

For primary bibliographic entry see Field 05G.  
W73-07822

##### THE ENVIRONMENT AS PROBLEM: II, CLEAN RHETORIC AND DIRTY WATER, For primary bibliographic entry see Field 05G. W73-07827

##### WATER RESOURCE DEVELOPMENT: SOME INSTITUTIONAL ASPECTS, Hawaii Univ., Honolulu, Coll. of Tropical Agriculture.

C. Gopalakrishnan.  
The American Journal of Economics and Sociology, Vol 30, No 4, p 421-428, October, 1971.

Descriptors: \*Water resources development, \*Institutional constraints, \*Water rights, \*Prior appropriation, Legal aspects, Economic efficiency, Beneficial use, Conservation, Dams, Water management (Applied), \*Montana.

Some of the institutional impediments to Montana's water resource development are examined. In Montana the ownership, control, and use of both surface and groundwater are governed by the doctrine of prior appropriation. Consequently, the system of water rights suffers from some of the following basic weaknesses of the appropriation doctrine: (1) the system is inflexible; (2) the emphasis on priority may result in economic inefficiencies; and (3) actual management of water programs is often vested with local water commissioners who have little expertise in water management. Some drawbacks specific to Montana's system of water rights include: (1) rights determined by private suits in which it is not necessary to join all parties concerned, and (2) rules that define abandonment as the concurrence of relinquishment of possession and intent not to resume it for a beneficial use. Also, state water agencies are handicapped by a dearth of funds and a lack of coordination with local water development groups. Another institutional problem is the attitude of the general public toward federal participation in water projects. Finally, feuds between conservationists and dam-builders have greatly slowed the development of water resources. (Settle-Wisconsin)  
W73-07828

##### SOUTH AFRICA, PROBLEMS OF A QUOTA-CONTROLLED FISHERY.

World Fishing, Vol 21, No 10, p 17, October, 1972.

Descriptors: \*Fisherries, Fishing, Regulation.

Identifiers: \*Pelagic fish, \*Quotas, South Africa, South West Africa.

The west coast of Africa is the last known major pelagic fishing ground in the world; all others have been destroyed. Pelagic fish include pilchards, anchovy, maasbunker, mackerel, redeye, and lantern. Catches of pelagic shoal fish in South Africa and South West Africa declined during the 1970-71 catching season, and were almost 350,000 tons less than in the previous season. The reduced South African catch occurred because of the application of relatively severe conservation measures to maintain the pilchard resources. These measures were applied to limit the overall tonnage, and one-third of each quota had to comprise pilchards. When these were landed, fishing operations had to cease. For the first time, a limit was also placed on the South African catch. However, a poor season prevented the industry from even reaching this limit. In addition, the International Commission for the South Atlantic Fisheries will make recommendations to member nations for regulation of fisheries off the west coast of Africa. The Commission predicts its conventions will boost the present two million tons of cultivated pelagic fish off the west coast to twenty million tons by 1980. (Settle-Wisconsin)  
W73-07830

##### MICHIGAN'S ENVIRONMENTAL PROTECTION ACT OF 1970: A PROGRESS REPORT, Michigan State Univ., East Lansing.

For primary bibliographic entry see Field 05G.  
W73-07982

##### ADMINISTRATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT, PART 1.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price \$5.00. Hearings—Subcomm. on Fisheries and Wildlfe Conservation—Comm. on Merchant Marine and Fisheries, United States House of Representatives, 91st Cong., 2d Sess., December 1970. 1270 p, 1 tab, 3 chart, 209 ref, 7 append.

Descriptors: \*Administrative agencies, \*Federal project policy, \*Legislation, \*Environmental effects, Governmental interrelations, Hydroelectric project licensing, Legal respects, Federal government, Judicial decisions, Law enforcement, Regulation, Federal Power Act, Environmental control, Administrative decisions, Legal review.  
Identifiers: \*Congressional hearings, \*National Environmental Policy Act of 1969.

These hearings were designed to help determine the effectiveness of the National Environmental Policy Act (NEPA), and the adequacy of agency responses to section 102 and 103 of the Act. The hearing also investigated what changes, if any, may be called for to improve the Act. Section 102 requires federal agencies to include detailed environmental statements on every major federal action affecting the environment. Section 103 requires federal agencies to review their operating procedures to collect any inconsistencies which prohibit full compliance with the Act. Inquires as to the status of the environmental impact statement requirement indicates an important start has been made in the implementation of the Act. Included is a mercury report of the Council on Environmental Quality, an analysis of Title 1 of the NEPA, the Draft Environmental Impact Statement for the Trans-Alaskan pipeline, and a detailed analysis of licensing procedure under the Federal Power Act. (Beardsey-Florida)  
W73-07983

## WATER RESOURCES PLANNING—Field 06

### Water Law and Institutions—Group 6E

**PROJECTS PROPOSED FOR INCLUSION IN OMNIBUS RIVER AND HARBOR AND FLOOD CONTROL LEGISLATION—1972.**  
For primary bibliographic entry see Field 05G.  
W73-07984

**POLECAT BENCH AREA OF THE SHOSHONE EXTENSIONS UNIT, WYOMING.**  
For primary bibliographic entry see Field 03F.  
W73-07985

**EFFECTS OF MERCURY POLLUTION ON HALIBUT AND THE ALASKAN FISHERY.**  
For primary bibliographic entry see Field 05C.  
W73-07986

**REPORT OF PROCEEDINGS AT PUBLIC HEARINGS RELATING TO APPLICATIONS FILED (TO THE WATER AND AIR QUALITY CONTROL COMMITTEE OF THE NORTH CAROLINA BOARD OF WATER AND AIR RESOURCES).**

North Carolina Board of Water And Air Resources, Raleigh. Water and Air Quality Control Committee.

For primary bibliographic entry see Field 05G.

W73-07987

**PROPOSED RECLASSIFICATIONS OF CERTAIN WATERS IN THE CHOWAN, NEUSE, PASQUOTANK, ROANOKE, TAR-PAMILICO, AND WHITE OAK RIVER BASINS, ETC.**

North Carolina Board of Water and Air Resources, Raleigh. Water and Air Quality Control Committee.

For primary bibliographic entry see Field 05G.

W73-07988

**NEW CLASSIFICATION ASSIGNED TO CERTAIN WATERS IN THE CAPE FEAR RIVER BASIN.**

North Carolina Board of Water and Air Resources, Raleigh.

For primary bibliographic entry see Field 05G.

W73-07989

**(ANNUAL REPORT OF THE DELAWARE RIVER BASIN COMMISSION, 1972).**

D Delaware River Basin Commission, Trenton, N.J.

1972. 28 p, 1 fig, 13 photo, 3 chart.

Descriptors: \*Delaware River Basin Commission, \*Delaware River, \*Interstate compacts, \*Governmental interrelations, \*Water management (Applied), River basins, Water sources, Water quality control, Air pollution, Floods, Flood damage, Water pollution control, Interstate commission, Pollution abatement, River basin development, Flood control, Water supply development.

**1971 MARKED THE END OF THE FIRST DECADE OF THE ORIGINAL INTERSTATE-FEDERAL RIVER BASIN COMPACT.** This annual report of the Delaware River Basin Compact between Pennsylvania, New York, New Jersey, and Delaware and the United States covers not only the activities of the Delaware River Basin Commission during the year ending June 1972 but also summarizes highlights of the Compact and the Commission since their inception in 1961. Moreover, comprehensive reports are furnished concerning the three floods that struck the Delaware River Valley during 1972. Topics discussed include water quality, tidal clean up, waste discharge abatement, energy regulation, flood plain management, pipelines and spills, sludge inventory, and surveillance of the concerned water bodies. Far-reaching progressive programs have been initiated in order to stop water and air pollution in the Delaware River Basin. The short-term results of these projects, charts,

graphs, and illustrations are included. (Mockler-Florida)  
W73-07990

**LIMITING FEDERAL RESERVED WATER RIGHTS THROUGH THE STATE COURTS,**  
L. B. Craig.  
Utah Law Review, Vol 1972, No 1, p 48-59, Spring 1972. 63 ref.

Descriptors: \*Reservation doctrine, \*Water rights, \*Prior appropriation, \*Priorities, Legal aspects, Federal jurisdiction, Federal-State water rights conflicts, Jurisdiction, Remedies, Judicial decisions, Legislation, Appropriation, Diversion, Water utilization, Eminent domain, Compensation.

Identifiers: \*Estoppel.

Much of the surface water currently being appropriated by private individuals in the arid western states is subject to superior federal rights based on the reservation doctrine. The possibility that the government could assert its superior rights to divert private appropriators has discouraged development of water resources in this region. A tracing of the historical development of the reservation doctrine is followed by a discussion of legislation introduced to initiate change. The role of the courts is also discussed; the courts must determine whether justice requires the private appropriator who has acquired water rights pursuant to state law without knowledge of the federal government's prior reserved rights to pay the cost of diversion of water to federal reserved lands or whether the cost would more properly be borne by the public generally. The doctrine of equitable estoppel is examined in relationship to this problem. Condemnation and compensation for private water rights are also discussed. (Mockler-Florida)  
W73-07991

**WATER LAW—PRIMARY JURISDICTION OF THE BOARD OF CONTROL OVER QUESTIONS OF WATER RIGHTS.**

Land and Water Law Review, Vol 7, No 2, p 599-614, 1972. 72 ref.

Descriptors: \*Wyoming, \*Jurisdiction, \*Water rights, \*Adjudication procedure, Legal aspects, State jurisdiction, Water law, Abandonment, Legal review, Judicial decisions, Administrative decisions, Watercourses (Legal aspects), Administrative agencies, Water supply.

Plaintiff reservoir company sued to have part of the water rights of defendant reservoir company declared abandoned. The plaintiff contended that the courts have concurrent jurisdiction with the Board of Control and may continue to initially determine abandonment questions; defendant contended that the Board had exclusive jurisdiction in this area. The court held that the Board of Control has primary jurisdiction over questions of abandonment of water rights. Thus while the Board and the courts still have concurrent jurisdiction over abandonment questions, before the lower court will grant relief, the abandonment issue should usually be initially determined by the Board. This comment discussed this case in detail and includes a background discussion, discussion on initiation of proceedings, district court discretion, review by appeals courts, and the impact on other areas of water law. This doctrine of primary jurisdiction will provide much needed flexibility to the adjudication procedure. (Mockler-Florida)  
W73-07992

**ENVIRONMENTAL IMPACT STATEMENTS—A DUTY OF INDEPENDENT INVESTIGATION BY FEDERAL AGENCIES.**

Colorado Law Review, Vol 44, No 1, p 161-172, August 1972. 63 ref.

Descriptors: \*Environmental effects, \*Legislation, \*Administrative decisions, \*Federal project policy, Legal aspects, Judicial decisions, Legal review, Administration, Project planning, Water resources development, Watercourses (Legal aspects), Administrative agencies, Adjudication procedure.

Identifiers: \*Environmental Impact Statements, \*National Environmental Policy Act.

The heart of the National Environmental Policy Act, (NEPA), is the section which requires all agencies of the federal government to include in every recommendation or report on major federal actions significantly affecting the quality of the human environment, a detailed statement on the environmental impact of the proposed action. This comment focuses on the interpretation of this section presented by the Court of Appeals for the Second Circuit in Greene County Planning Board v. Federal Power Commission which held that the environmental impact statement is to be prepared by the agency itself which is proposing the action; the agency cannot satisfy NEPA by preparing the statement on the basis of information provided by others. This case may further the cause of long-range environmental planning. However, NEPA is in serious trouble due to the gap between the goals it sets out and the means and will to implement its procedures. (Mockler-Florida)  
W73-07993

**PRIVATE REMEDIES FOR BEACH FRONT PROPERTY DAMAGE CAUSED BY OIL POLLUTION OF MISSISSIPPI COASTAL WATERS.**  
For primary bibliographic entry see Field 05G.  
W73-07994

**THE YEAR OF SPOILED PORK: COMMENTS ON THE COURT'S EMERGENCE AS AN ENVIRONMENTAL DEFENDER,**  
Florida Univ., Gainesville.

For primary bibliographic entry see Field 05G.  
W73-07996

**F. W. GUEST MEMORIAL LECTURE: RIVER POLLUTION AND THE LAW,**  
For primary bibliographic entry see Field 05G.  
W73-07997

**CRIMINAL LIABILITY UNDER THE REFUSE ACT OF 1899 AND THE REFUSE ACT PERMIT PROGRAM.**

Journal of Criminal Law, Criminal and Police Science, Vol 63, No 3, p 366-376, September 1972. 117 ref.

Descriptors: \*Federal Water Pollution Control Act, \*Law enforcement, \*Penalties (Legal), \*Permits, \*Legislation, Federal government, State governments, Judicial decisions, Negligence, Legal aspects, Water pollution, Pollution abatement, Water pollution control, Navigable waters, Water law, Rivers and Harbors Act.

Identifiers: \*Refuse Act, Absolute liability, Injunctions (Prohibitory), Licenses.

This comment deals with criminal liability for water pollution under the Refuse Act and the Federal Water Pollution Control Act (FWPCA). Section 411 of the Refuse Act provides for fines or imprisonment for discharges of any refuse into navigable water without a permit. However, courts have been reluctant to find corporate officials personally liable for violations caused by their companies. Consequently, the United States Supreme Court has held that injunctive relief is appropriate to insure effectiveness of the statute. The FWPCA does not impose criminal liability, but operates through civil enforcement of state water quality standards. These standards may conflict with liability under the Refuse Act; since the Refuse Act is not superseded by FWPCA legisla-

## Field 06—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

tion, it is possible that one may be officially in complicity with FWPCA standards and yet be criminally liable under the Refuse Act. In order to resolve this conflict the Refuse Act Permit Program was established which makes the issuance of a permit contingent primarily on the applicant's compliance with state water quality standards. (Adams-Florida)

W73-07998

#### ENVIRONMENTAL LAW: STRICT COMPLIANCE WITH PROCEDURAL REQUIREMENTS OF NEPA—THE AGENCIES MUST PLAY BY THE RULES,

R. Nielsen.

University of Florida Law Review, Vol 24, No 4, p 814-820, Summer 1972. 74 ref.

Descriptors: \*Decision making, \*Administrative decisions, \*Federal project policy, \*Project planning, \*Legal review, Environmental effects, Administrative agencies, Permits, Project benefits, Legal aspects, Federal government, Judicial decisions, Legislation, Water law, Planning, Analytical techniques, Nuclear powerplants, Thermal pollution.

Identifiers: \*Environmental Impact Statement, \*National Environmental Policy Act, \*Licenses.

The National Environmental Policy Act (NEPA) was designed as an agency regulating statute, applicable to all federal agency actions having a potential environmental impact. Substantively, the Act requires the federal government to insure environmental quality in federal activities. It also demands that certain procedural requirements be followed to the fullest extent possible by any federal agency considering environment-affecting projects. Recently, federal agencies have been under attack for lack of compliance with NEPA requirements. In Calvert Cliffs' Coordinating Committee v. Atomic Energy Commission, an environmental protection group brought suit challenging the Commission's approval of a construction permit for two nuclear power plants pending a complete review of NEPA imposed requirements. The U.S. District Court of Appeals held that the Commission's procedures were inadequate because they failed to sufficiently consider environmental values, failed to require environmental impact considerations, and omitted independent project evaluations. The court distinguished substantive duties imposed by NEPA from procedural provisions of the Act on the grounds that the former leave room for agency discretion while the latter must be strictly adhered to. In particular, agencies are required to implement a systematic balancing analysis in each action affecting the environment. (Adams-Florida)

W73-07999

#### DEPARTMENT OF NATURAL RESOURCES; DIVISION OF WATER POLLUTION CONTROL

Mass. Ann. Laws ch. 21 secs 1 thru 19, 26 thru 53 (Supp. 1971).

Descriptors: \*Legislation, \*Water pollution control, \*Water management (Applied), \*Massachusetts, Eminent domain, Flood control, Public access, Recreation, Aesthetics, Public health (Laws), Permits, Planning, Oil pollution, Administrative agencies, Law enforcement, Impoundments, Water supply, Penalties (Legal), Pollution abatement.

These Massachusetts statutory provisions provide for the creation of a Department of Natural Resources and for the implementation of its purposes. Included within the Department is a Division of Water Resources with various duties of water management and control. The Commission of Water Resources is empowered to purchase, give, lease or acquire by eminent domain any lands and waters to protect water impoundment sites.

Reference is made to recreational needs and provisions for source are included. A Division of Water Pollution Control is created and is especially concerned with oil pollution. This division must develop pollution control plans, conduct studies, and adopt water quality standards. The legislature provides for legal sanctions for anyone violating the water quality standards. Municipal corporations may be authorized to construct abatement facilities. Fines are levied upon those who cause pollution in excess of the Commission standards, and orders may be issued to cease. (Smith-Adam-Florida)

W73-08000

W73-08002

#### ILLINOIS AND DESPLAINES RIVERS; KASKASKIA RIVER WATERSHED.

111. Ann. Stat. ch. 19 secs. 38 thru 41.1 (Smith-Hurd 1972).

Descriptors: \*Illinois, \*Legislation, \*Watershed management, \*Obstructions to flow, \*Navigation, Legal aspects, Navigable rivers, Jurisdiction, Flood control, Drainage, Water supply, Watercourses (Legal aspects), Water storage, Water management (Applied), River basin development.

This statute formally recognizes the Desplaines and Illinois Rivers as navigable in law and charges the Governor and Attorney General of Illinois with the responsibility of preventing the erection of any structure in or across the streams without explicit authority. These officials are also directed to take necessary legal action to remove all obstructions now existing that in any way interfere with the intent and purpose of the legislation. Another statute contained herein gives the Illinois Department of Transportation the authority to independently engage in the formulation of plans, acquisition of rights of way, construction, operation and maintenance of any navigation, flood control, drainage, levee, water supply and water storage and other water resource improvements and facilities in connection with the development of the Kaskaskia River Watershed. The Department has jurisdiction and supervision over any and all phases of developments and improvements in the basin. (Mockler-Florida)

W73-08003

#### REMOVAL OF OBSTRUCTIONS.

111. Ann. Stat. ch. 19 secs 42 thru 47e (Smith-Hurd Supp. 1971).

Descriptors: \*Illinois, \*Navigation, \*Ships, \*Legislation, \*Flotsam, Legal aspects, Water policy, Obstruction to flow, Penalties (Legal), Transportation, Boats, State jurisdiction, Administrative agencies.

It is unlawful to tie up or anchor vessels or other water craft in public or navigable waters in such a manner as to prevent or obstruct in any manner the passage of any vessels or craft. The owner of a sunken craft has the duty to immediately mark it with a buoy or beacon during the day and a Lighted lantern at night, and to maintain such marks until the sunken craft is removed or abandoned, and the neglect or failure of the owner to do so is unlawful. If such obstruction is left for more than thirty days, the State Department of Transportation shall remove it in any manner within its discretion. The expense of removal shall be charged to the owner of the vessel. Violations of this act shall be punishable by fines of between five hundred and one thousand dollars and/or by imprisonment of between thirty days and one year. (Mockler-Florida)

W73-08004

#### HIRSCH V. STEFFEN (LIABILITY FOR OBSTRUCTION OF NATURAL DRAINWAY).

488 S.W.2d 240-245 (Ct. App. Mo. 1972).

Descriptors: \*Drainage patterns (Geologic), \*Missouri, \*Natural drainage, \*Obstruction, Legal aspects, Constitutional law, Dams, Water control, Drainage practices, Drainage water, Natural flow, Drainage engineering, Judicial decisions, Drainage effects.

Plaintiffs, upstream riparian landowners, sued to compel defendants, downstream riparian landowners, to remove an obstruction to the natural drainage. Defendants had erected a dam on a river bed which was usually dry. However, the dam did cause an overflow on upstream lands at times by

## WATER RESOURCES PLANNING—Field 06

### Water Law and Institutions—Group 6E

blocking the flow of surface water. Prior to construction of the dam the old river bed had been the natural drainage flow for the area. The Missouri Court of Appeals held that a natural watercourse or drainage may not be obstructed without liability to those harmed by the obstruction. Moreover, this river bed was a natural drainage and the court could issue a mandatory injunction requiring removal of the obstruction. Furthermore the court could order defendant to restore the old river channel to a near proximation of its previous depth and width prior to defendant's action in damming the old river bed and blocking the channel. (Mockler-Florida) W73-08007

**CONNERY V. PERDIDO KEY, INC. (OWNERSHIP OF LANDS BETWEEN MEANDER LINE AND HIGH WATER MARK).**  
270 So. 2d 390-394 (1st D.C.A. Fla. 1973).

Descriptors: \*High water mark, \*Florida, \*Meanders, \*Boundaries (Property), \*Boundary disputes, Legal aspects, Islands, Ownership, Surveys, Mapping, Measurement, Judicial decisions, Water level fluctuations.

Identifiers: \*Meander lines.

Plaintiff landowner brought an ejectment action against defendant realty company to determine ownership of a part of an island. Following a government survey and meandering, the island was conveyed by the United States to plaintiff's predecessor in title. The land in dispute lay outside of the government meander line. Defendant contended it was omitted from the survey line either intentionally or as a result of a gross error and thus is not included in the original conveyance. Defendant has filed a homestead application for the un-surveyed land. The District Court of Appeals held that unless lands lying between the meander line and the present high water mark were excluded from the survey intentionally or due to gross error, the meander line does not constitute the boundary; rather the high water mark of the waterbody is the boundary. Meander lines were not designed to be boundaries. The court further held that the evidence was insufficient to support the contention that the lands in dispute were omitted intentionally or because of gross error. Thus, the high water mark is the boundary of plaintiff's lands, not the meander line. The court affirmed the trial court holding for plaintiff. (Mockler-Florida) W73-08006

**IN RE WEST MANAGEMENT DISTRICT (PETITION TO CREATE DRAINAGE DISTRICT).**

269 So. 2d 405-407 (2d D.C.A. Fla. 1972).

Descriptors: \*Florida, \*Public rights, \*Local governments, \*Drainage districts, Legal aspects, Drainage, governments, Water policy, Drainage systems, Drainage programs, Jurisdiction, Legislation, Judicial decisions, Surface runoff.

Petitioner, a county resident, sought to create a drainage district pursuant to state statute but was opposed by the county. The trial court denied the county's motion to dismiss the petition and also denied the county's right to intervene. The appeals court held that under the rule allowing anyone claiming an interest in pending litigation to assert his right by intervention, the county was entitled to intervene in an action to create a drainage district. The court based its decision on the rationale that the county must be given this right since it had the authority to establish and administer programs concerning drainage and to cooperate with governmental agencies and private enterprises in the development and operation of such programs. The court also indicated that the statute providing that any landowner who did not sign the petition for a drainage district may advocate or resist the organization and incorporation of a drainage district

did not preclude the county from intervening in the petition to create the drainage districts. (Mockler-Florida) W73-08007

**SEEGREN V. ENVIRONMENTAL PROTECTION AGENCY (PETITION FOR HARDSHIP VARIANCE FOR USE OF SANITARY SEWERS).**  
291 N.E.2d 347-349 (Ct. App. Ill. 1972).

Descriptors: \*Illinois, \*Judicial decisions, \*Treatment facilities, \*Sewage treatment, Legal aspects, Sanitary systems, Public health, Sewage, Waste disposal, Municipal wastes, Legal review, Sewage effluents, Sewers, Permits, Adjudication procedure, Administrative decisions, Land development, Urbanization.

Petitioner, land developer, sought review of an order of the respondent Illinois Pollution Control Board denying a petition for a hardship variance to permit construction of sewer extensions to a housing development and apartment complex built by petitioner. The Board was under a court order banning further extensions to existing facilities until the treatment plant could adequately treat additional effluents. Petitioner contended that the Board had consistently granted variances and permitted connections to existing facilities where it was shown that substantial investment in and development of the project had occurred prior to the prohibitory order. Petitioner had completed two apartment buildings a month prior to the order. The Illinois Appellate Court held that in view of previous variance policy of the Board, petitioner had proven an unreasonable hardship and the Board's decision was contrary to the weight of evidence. The Court remanded the case to the Board with directions to issue the proper certificates. (Mockler-Florida) W73-08008

**STALEY MANUFACTURING CO. V. ENVIRONMENTAL PROTECTION AGENCY (REGULATION OF DISCHARGES FROM PRIVATE SEWER INTO MUNICIPAL SEWER).**  
290 N.E.2d 892-897 (Ct. App. Ill. 1972).

Descriptors: \*Illinois, \*Sewage treatment, \*Jurisdiction, \*Waste treatment, Legal aspects, Water quality, Water law, Water pollution control, Water pollution sources, Legal review, Administrative decisions, Treatment facilities, Industrial wastes, Effluents.

Petitioner, industrial plant, sought judicial review of a regulation promulgated by the respondent, State Pollution Control Board. Petitioner owned a private sewer which emptied into the municipal treatment system. The disputed regulation would restrict the types, concentrations and quantities of contaminants which could be discharged into municipal sewer systems. Petitioner contended that respondent's jurisdiction extended only to discharges into waters of the state and that this administrative regulation therefore exceeded the Board's statutory authority. The Illinois Appellate Court held that there was a proper nexus between controlling what flows into a sewage treatment plant and what flows out of the plant and into the waters of the state; thus, the Board did have authority to compel the operator of a private sewer system which empties into a municipal sewer to adequately treat its contaminants before they reached the municipal system. The court thereby affirmed the regulation by the Pollution Control Board. (Mockler-Florida) W73-08009

**BOOKER V. WEVER (OWNERSHIP OF RE-LICITED LAND).**  
202 N.W.2d 439-443 (Ct. App. Mich. 1972).

Descriptors: \*Michigan, \*Riparian rights, \*Boundaries, \*Boundary disputes, Legal aspects, Adjacent landowners, Judicial decisions, Lakes, Riparian land, Watercourses (Legal aspects).  
Identifiers: \*Reliction.

Plaintiff riparian landowner sought a declaratory judgment against defendant adjacent riparian landowner to determine the ownership of land uncovered by reliction. The issue was raised as a result of the lowering of the water level of the lake. The appeals court held that the relicted land should be divided in proportion to shoreline owned. The shoreline to be used would be that shoreline at the time the lake and surrounding land was patented by the United States to the State of Michigan. The court also added that courses and distances in the deed description would yield to natural monuments such as the shoreline of the lake. (Mockler-Florida)  
W73-08010

**WILSON CONCRETE COMPANY V. COUNTY OF SARPY (LIABILITY FOR OBSTRUCTION OF NATURAL FLOW).**

202 N.W.2d 597-600 (Neb. 1972).

Descriptors: \*Nebraska, \*Obstruction to flow, \*Drainage effects, \*Drainage patterns (Geologic), Barriers, Stream flow, Judicial decisions, Highway effects, Drainage engineering, Natural flow, Alteration of flow, Culverts, Drainage water, Drainage practices, Legal aspects.  
Identifiers: Injunctive relief.

Plaintiff landowner sued for damages and an injunction requiring the defendant county to provide an adequate drainage under a highway for water of a natural watercourse. In constructing the highway, defendant had placed a single ten-by-ten foot box culvert where there had previously been an open ditch as an outlet for a creek to drain from the plaintiff's land. The Nebraska Supreme Court held that the culvert was inadequate and that it would cause considerable backwater. The court further held that removal of the culvert, thus leaving an open cut, would reduce the flooding, and therefore plaintiff was entitled to a mandatory injunction requiring defendant to remove the obstruction in order to provide for the passage of the surface waters. (Mockler-Florida) W73-08011

**PROCEEDING 1971 TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.**

Oregon State Univ., Corvallis.  
For primary bibliographic entry see Field 05B.  
W73-08051

**BUREAU OF RECLAMATION,**  
Bureau of Reclamation, Denver, Colo. Applied Sciences Branch.  
For primary bibliographic entry see Field 05G.  
W73-08108

**FORECAST STUDY FOR PRAIRIE PROVINCES WATER BOARD,**  
Water Survey of Canada, Calgary (Alberta). Alberta and Northwest Territories District Office.  
For primary bibliographic entry see Field 04A.  
W73-08143

**A WILDERNESS SNOW COURSE,**  
Forest Service (USDA), Kalispell, Mont. Flathead National Forest.  
For primary bibliographic entry see Field 02C.  
W73-08148

## Field 06—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

**WILDERNESS IN THE NATIONAL PARKS,**  
National Park Service, Denver, Colo. Denver Service Center.  
For primary bibliographic entry see Field 04C.  
W73-08149

**CLEAN WATER FOR SAN FRANCISCO BAY.**  
California State Water Resources Control Board, Sacramento.

April 1971. 16 p, 13 fig.

Descriptors: \*Water reuse, \*Bays, \*Planning, \*Administration, \*Water pollution control, \*Water quality control, California, Water pollution sources, Water pollution effects, Regional analysis, Domestic wastes, Industrial wastes, Waste disposal.

Identifiers: \*San Francisco Bay.

In order to preserve and enhance water quality in San Francisco Bay, in view of the inevitable increase in waste loads, the present system of independent decision making by each wastewater discharger must be replaced by an areawide approach. Establishment of a Bay Area service agency, or utility, with powers to plan, finance and construct facilities is needed. Three feasible methods of forming such an agency are: (1) create a permanent agency by special enactment of the California State Legislature (preferred method); (2) create a permanent agency by the voluntary cooperation of all Bay Area wastewater districts; and (3) create a temporary agency by voluntary cooperation until a permanent agency can be set up. While studies show that the Bay is being badly polluted by many sources, including municipal and industrial, and that these pollutants range from nutrients, organics and coliform to toxic materials, these studies have also shown that there is a great potential for wastewater reclamation in the Bay area, especially municipal sewage. Along with maps and pictures showing areas on the Bay which are posted and have yearly fish kills is a map showing the potential reuse of reclaimed water for industrial use, aquifer recharge, landscape irrigation and spray irrigation. The potential market for reclaimed water is estimated at 200 mgd of the 800 mgd currently discharged into the Bay. (Poertner) W73-08176

**BRIDGES, WALLS, FILLS, CHANNEL CHANGES, ETC. (FOR THE INFORMATION OF THOSE INTERESTED IN THE CONSTRUCTION OF).**  
Pennsylvania Dept. of Environmental Resources, Harrisburg.  
For primary bibliographic entry see Field 08A.  
W73-08182

**THE CLEAN STREAMS LAW OF PENNSYLVANIA.**  
Pennsylvania Dept. of Environmental Resources, Harrisburg.

1971. 19 p.

Descriptors: \*Water quality act, \*Water quality control, \*Legislation, \*Pennsylvania, Water quality standards, Water pollution control, Municipal wastes, Industrial wastes, Legal aspects, Permits, Water pollution sources.

The Clean Streams Law, which became effective January 19, 1971 in Pennsylvania, established the Department of Environmental Resources, the Environmental Quality Board, and a citizen advisory council. Concurrent with this was the abolishment of the Sanitary Water Board and the Department of Mines and Mineral Industries, with the transfer of their duties to the newly created Department of Environmental Resources. Along with this change also came the rewording of laws to correspond to these governmental structural changes and the

new law is the subject of this publication. The general rules concerning water pollution are described in ten sections. These ten articles include: (1) general provisions and purpose, (2) sewage pollution, (3) industrial wastes, (4) other pollutions and potential pollutions, (5) domestic water supplies, (6) procedures and enforcement, and (7) existing rights under the old law. Some parts of the old laws were repealed, while additions were made to the new law, including the addition of penalties and other remedies for controlling pollution. (Poertner) W73-08183

#### INVENTORY OF INTERSTATE CARRIER WATER SUPPLY SYSTEMS.

Environmental Protection Agency, Washington, D.C. Water Supply Div.  
For primary bibliographic entry see Field 05F.  
W73-08192

#### GREAT DISMAL SWAMP AND DISMAL SWAMP CANAL.

Hearing—Subcomm. on Parks and Recreation—Comm. on Interior and Insular Affairs, United States Senate, 92d Cong, 2d Sess, May 9, 1972. 25 p, 1 map.

Descriptors: \*Swamps, \*Wetlands, \*Legislation, \*Marsh management, Drainage effects, Legal aspects, Land reclamation, Marshes, Irrigation effects, Recreation, \*Virginia, \*North Carolina, Boating, Urbanization.

Identifiers: \*Congressional hearings.

This hearing took testimony on a bill to authorize a study to determine the most feasible means of protecting and preserving the Great Dismal Swamp and the Dismal Swamp Canal. Encroaching metropolitan areas have threatened and begun to affect the Great Dismal; because it is an area of great national significance the states of Virginia and North Carolina have made efforts to determine the best ways to preserve it. These states decided to apply to all state and federal agencies to obtain aid. This hearing speaks favorably of preserving the Great Dismal, as it is unique in its physical properties, both flora and fauna. Included is a Department of the Interior study and statements by numerous interested parties, including the chairman of the Dismal Swamp Committee, Virginia Division of the Isaac Walton League of America, an Administrative assistant of the Wildlife, National Parks and Conservation Association and senators from the State of Virginia. (Smith-Adam-Florida) W73-08193

#### PRESERVATION AND ENHANCEMENT OF THE AMERICAN FALLS AT NIAGARA.

For primary bibliographic entry see Field 06G.  
W73-08194

#### THE IMPACT OF THE NATIONAL ENVIRONMENTAL POLICY ACT UPON ADMINISTRATION OF THE FEDERAL POWER ACT.

For primary bibliographic entry see Field 06G.  
W73-08195

#### HOW AN ENFORCER BECOMES THE POLLUTER'S DEFENDER.

For primary bibliographic entry see Field 05G.  
W73-08196

#### A SURVEY OF STATE REGULATION OF DREDGE AND FILL OPERATIONS IN NON-NAVIGABLE WATERS.

Florida Univ., Gainesville. School of Law.  
For primary bibliographic entry see Field 04A.  
W73-08197

**THE WATER RESOURCES COUNCIL.**  
National Water Commission, Arlington, Va.  
E. Liebman.

Available from the National Technical Information Service as PB-211 443, \$6.75 in paper copy, \$1.45 in microfiche. May 1972. 224 p, 357 ref.

Descriptors: \*Water resources development, \*U.S. Water Resources Council, \*National Water Commission, \*Water Resources Planning Act, \*Planning, Water resources, Flood control, Land resources, Interstate compacts, Water pollution, Administration, Legislation, Project planning, Governmental interrelations, River basin commissions, Grants, Government finance, Administrative agencies, Flood plain zoning, Cost sharing.

This report on the Water Resources Council was prepared for the National Water Commission to assist in its deliberations on national water problems. A number of recommendations are made for improving the Council including the appointment of an independent full-time chairman, the addition of an independent board of review, and the provision in future legislation for water resources planning coordination at the state and federal levels. The Water Resources Planning Act and its historical background, the Water Resources Council and its activities, the principles and standards for planning water and related land resources, flood hazards, compacts, water pollution planning, and an evaluation of the assumptions underlying the Water Resources Planning Act are discussed. Portions of vital legislation concerning the Council and its activities are included. (Mockler-Florida) W73-08198

#### OCEANOGRAPHIC COMMISSION.

Washington Natural Resources and Recreation Agencies, Olympia.

In: 1972 Annual Report State of Washington, p 47-49, 1972.

Descriptors: \*Washington, \*Oceanography, \*Research and development, \*Administrative agencies, Administration, Water law, Water rights, Education, Oil pollution, Water policy, Oceans, Government finance, Oil spills, Data collection, Governmental interrelations.

Identifiers: Hazardous substances (Pollution).

The 1972 annual report of the Oceanographic Commission of the State of Washington is presented. This Commission, created in 1967, is the only state agency specifically mandated to promote, develop, and advise on oceanography. It has neither regulatory powers to enforce state laws nor landlord responsibilities for managing state property. Fiscal year 1972 provided the Commission with a solid economic footing to enable it to meet many of its goals. Programs undertaken by the Commission included: an oil transportation study, a study on hazardous wastes in the area's waters, and oil handling studies. In addition the Commission operated a news bureau, held press conferences, participated in various workshops, and provided speakers for civic groups, schools, and professional societies during the year. In the future the Commission will expand and become involved in such areas as advancement of applied marine research and knowledge, standardization of data, cooperative coordination of state oceanographic and marine programs, and improvement of school and university curricula relating to oceanography. (Mockler-Florida) W73-08199

#### DEPARTMENT OF ECOLOGY.

Washington Natural Resources and Recreation Agencies, Olympia.  
For primary bibliographic entry see Field 06G.  
W73-08200

## WATER RESOURCES PLANNING—Field 06

### Water Law and Institutions—Group 6E

**TIDELANDS—URGENT QUESTIONS IN SOUTH CAROLINA WATER RESOURCES LAWS**,  
South Carolina Univ., Columbia. School of Law.  
C. H. Randall, Jr.  
Paper presented at Fifth Annual South Carolina Governor's Conference on Water Resources, September 21, 1971. 23 p. OWRR-B-023-SC (1).

**Descriptors:** \*Land management, \*Coasts, \*Legislation, \*South Carolina, Navigable waters, Land use, Land development, State jurisdiction, Permits, Regulation, Zoning, Water law, Oceans, Ownership of beds, Environmental control, Environmental effects, Water pollution, Judicial decisions, Submerged Lands Act, Rivers and Harbors Act, Governmental interrelations, Legal review.

**Identifiers:** \*Coastal zone management, Tidelands, Coastal waters, Estuarine Areas Act of 1968.

In developing a sound tidelands policy, there are important interests that must be weighed in the balance with protection of the environment. One is the interest in developing the economy of the state. Closely related is the interest in providing citizens the maximum freedom compatible with protecting the environment. The legal device most capable of meeting the problem is the combination of zoning of the tide lands for specified appropriate uses, and the granting of permits for particular activities. The problems and current developments in rethinking tidelands law are discussed under three headings: federal legislative policy, state legislative policy, and judicial policy. Pending legislation, pertinent federal statutory law, and current state law are all discussed. If the question involving title to the tidelands were substantially resolved in favor of the state of South Carolina, power to zone and set up a permit system would be largely unquestioned. Several legal justifications for such a zoning statute are suggested. (Reed-Florida)  
W73-08201

**DIGEST OF PROPOSED REGULATION RELATING TO MONITORING AND REPORTING WASTEWATER DISCHARGES AND THEIR EFFECTS UPON RECEIVING WATERS.**  
For primary bibliographic entry see Field 05D.  
W73-08202

**REPORT OF THE UNITED NATIONS CONFERENCE ON HUMAN ENVIRONMENT, HELD AT STOCKHOLM, 5-16 JUNE, 1972.**  
For primary bibliographic entry see Field 06G.  
W73-08203

**LEGAL ASPECTS OF COASTAL ZONE MANAGEMENT IN ESCAMBIA AND SAN ROSA COUNTIES, FLORIDA (ESCAROSA),**  
D. M. O'Connor.

Report submitted to Coastal Coordinating Council, Florida Department of Natural Resources, March 1972. 77 p. 2 append.

**Descriptors:** \*Land management, \*Land development, \*Florida, \*Local governments, \*Coasts, Legal review, State jurisdiction, Judicial decisions, Institutional constraints, Coastal marshes, Wetlands, Legal aspects, Land use, Governmental interrelations, Water law, Water resources development, Zoning, State governments, Legislation.

**Identifiers:** \*Coastal zone management.

While any effective coastal zone management program must provide statewide and nationwide uniformity, the substantial jurisdictional powers of county and local governments must be taken into account. The integration of these local governments into the coastal zone management program can provide better management than could be achieved by the state and federal authori-

ties acting alone. Present activities of local governments in coastal zone management in Escambia and Santa Rosa Counties, Florida were examined. Local laws and judicial decisions relevant to county governments, municipal governments, a port authority and the Santa Rosa Island Authority, are examined in relationship to coastal zone management. State laws and federal laws are also discussed in this context. There appear to be a number of opportunities for cooperation between state, county and local bodies which should be explored and developed in order to make Florida coastal zone management fully effective. (Beardley-Florida)  
W73-08204

**IMMINENT IRREPARABLE INJURY: A NEED FOR REFORM.**  
For primary bibliographic entry see Field 05G.  
W73-08205

**ARTIFICIAL ADDITIONS TO RIPARIAN LAND: EXTENDING THE DOCTRINE OF ACCRETION,**  
R. E. Lundquist.

Arizona Law Review, Vol 14, No 2, p 315-343, 1972. 134 ref.

**Descriptors:** \*Arizona, \*Accretion (Legal aspects), \*Riparian rights, \*Ownership of beds, \*Riparian land, Land tenure, Common law, Easements, Judicial decisions, Riparian waters, Usufructuary right, Submerged Lands Act, Bank erosion, Boundaries (Property), Land reclamation, Navigable rivers, Federal government, Dredging, High water mark, Avulsion, Watercourses (Legal aspects).  
Identifiers: Reliction.

The Supreme Court of Arizona in *State v. Bonelli Cattle Company*, a case of first impression, declined to extend the doctrine of accretion to man-made additions to riparian land. The Bonelli decision is analyzed in terms of its implications for Arizona riparian landowners. In Bonelli the court distinguished between natural and man-made accretions and held that tide to lands exposed by dredging projects of the federal government vests in the state. Four arguments are presented in favor of including in the doctrine of accretion man-made additions to riparian land, contrary to the Bonelli holding. This decision fails to consider the certain loss of riparian status due to man-made accretion. Such an omission forbodes the demise of the riparian right of access to navigable waters in Arizona. It is proposed that the riparian owner should be given the right to purchase these accretions with the proceeds going to establish a fund to promote the public use of navigable waters. (Adams-Florida)  
W73-08206

**ENVIRONMENTAL LAW—PRIVATE CAUSE OF ACTION UNDER THE RIVERS AND HARBORS APPROPRIATION ACT OF 1899 FOR INJURY TO THE ECOLOGY OF NAVIGABLE WATERS,**  
For primary bibliographic entry see Field 05G.  
W73-08207

**THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 SAVED FROM 'CRABBED INTERPRETATION',**  
H. A. Cubell.

Boston University Law Review, Vol 52, No 2, p 425-442, Spring 1972. 104 ref.

**Descriptors:** \*Judicial decisions, \*Federal project policy, \*Legislation, \*Decision making, \*Administrative decisions, Legal review, Project planning, Cost-benefit analysis, Federal government, Administrative agencies, Ecology, Environmental effects, Legal aspects, Project feasibility, Administration, Alternate planning, Environment,

Economic justification, Comprehensive planning, Water law.  
**Identifiers:** \*National Environmental Policy Act.

The judicial interpretation of the National Environmental Policy Act (NEPA) of 1969 was, in Calvert Cliffs' Coordinating Committee v. Atomic Energy Commission, recently expanded. Section 101 of NEPA is a broad policy statement insuring a federal commitment to preserve environmental quality. Section 102 of the Act contains procedural duties which must be met by any agency considering major federal activity which might have an adverse effect on the environment. The court in the Calvert Cliffs' case, after adopting a substantive-procedural dichotomy between Section 101 and 102, held that agencies, in determining the overall desirability of a project, must strike a balance between economic, technical, and environmental costs and benefits. The court acknowledged that the plain language of the Act does not require a balancing analysis; Section 102 only requires that environmental values be given appropriate consideration. However, the court recognized that environmental protection is to be considered as a competing priority to be assessed in view of other essential considerations, which implies a need for a balancing of these values on a case-by-case basis. (Adams-Florida)  
W73-08208

**ILLINOIS WATERWAY.**

Ill. Ann. Stat. Ch. 19 secs. 79 thru 112 (Smith-Hurd 1972).

**Descriptors:** \*Illinois, \*Legislation, \*Navigable waters, \*Navigation, \*Canals, Channels, Transportation, Ships, Civil engineering, Inland Waterways, Legal Aspects, Jurisdiction, Eminent domain, Water law.  
**Identifiers:** \*Illinois Waterway.

The statutes govern the location, name, general route, dimensions of the channel and locks, plans and specifications for construction, maintenance and operation, lease of surplus waters, rates of toll, rules and regulations, maintenance of power plants and storage facilities, acquisition of property, repair, replacement or reconstruction of public bridges, and sale or lease of lands pertaining to the Waterway. The State Department of Transportation is charged with the overall responsibility of maintaining and improving the Waterway. Other areas covered by statute include permits, contracts, eminent domain procedures, construction procedures, drainage systems, sanitary regulations, and bridges. (Mockler-Florida)  
W73-08225

**NATURAL RESOURCES DEVELOPMENT BOARD.**

Ill. Ann. Stat. ch. 19 secs. 1071 thru 1077.13 (Smith-Hurd 1972).

**Descriptors:** \*Illinois, \*Legislation, \*Water supply, \*Water policy, \*Water management (Applied), Conservation, Water resources, Water resources development, Water law, Water demand, Water supply development, Flood control, Flood plains, Watershed management, Navigation, Public health, Future planning (Projected), Legal aspects, Governmental interrelations, Administrative agencies, Project planning.

In order to provide sound planning for the proper conservation, development and use of water resources, upon which the health, welfare and economic progress of Illinois depend, the Natural Resources Development Board is created. The Board shall receive staff services from the Department of Business and Economic Development, but when necessary shall receive the assistance of any state educational institution or experiment station.

## Field 06—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

The Board shall prepare a biennial assessment of the adequacy of the water supplies of the state, and shall recommend to the Governor and State Assembly appropriate policies, legislation and programs necessary to insure the availability of adequate supplies of water. It shall effect maximum coordination between all state agencies in planning and developing water resources, as well as review all proposed legislation, water resources projects and developments, and any state water programs and activities. The Board shall also investigate any project involving navigation improvement, flood control or watersheds of the state. (Glickman-Florida)  
W73-08226

**UPPER MISSISSIPPI RIVERWAY COMPACT.**  
Ill. Ann. Stat., ch. 19 secs 1101 thru 1103 (Smith-Hurd 1972).

Descriptors: \*Interstate compacts, \*River basin development, \*Illinois, \*Legislation, Resources development, Water management (Applied), Interstate commissions, Mississippi River Basin, Iowa, Minnesota, Wisconsin, Missouri, Natural resources, Conservation, Resource allocation, Research and development, Wildlife conservation, Recreation facilities, Agriculture, Administration, Permits, Planning.  
Identifiers: \*Upper Mississippi Riverway Compact.

The size of the Upper Mississippi region, the complexity of its economic and social development and the resource needs of its people require a formal instrument for joint and cooperative action in the development and maintenance of a sound and attractive Upper Mississippi region. The purposes of the compact are stated and the geographical area comprising the Upper Mississippi Riverway District is specified within these statutes. A Commission composed of representatives from each party state is established. The structure, powers, duties and responsibilities of the Commission are detailed in the statute. A study of means of preserving and developing the scenic value of both public and private property is to be made by the Commission. The Commission may acquire such easements and make such agreements as may be suitable to preserving or securing patterns or features of land and water use that will be consistent with the terms of the compact. The statute provides that the compact shall enter into force when enacted into law by three of the participating states. (Reed-Florida)  
W73-08227

**SULLIVAN V. MORENO (WHETHER A SIMPLE RIPARIAN BOUNDARY OPERATES BY LEGAL PRESUMPTION TO CARRY THE RIGHT TO THE SOIL TO THE EDGE OF THE CHANNEL).**

19 Fla. 200-231 (1882).

Descriptors: \*Ownership of beds, \*Florida, \*Riparian land, \*Riparian rights, Water law, Water rights, Legal aspects, Legislation, Remedies, Water sources, Judicial decisions, Beds under water, Boundary disputes, Adjacent landowners.  
Identifiers: Injunction relief.

This case, decided by the state's supreme court in 1882, involved an action brought by plaintiff landowner against defendant adjacent landowner to determine whether a simple riparian boundary operates by legal presumption to carry the right to the soil at the edge of the channel under the Riparian Act of 1856. Plaintiff contended the possession and enjoyment of his riparian rights had been violated by the defendant's construction of a wharf thereby denying plaintiff access to his wood and coal yard. The court noted that under state law the title to the submerged soil from the channel to the shore is in such riparian proprietor as is contem-

plated by the act of 1856 and held that this act contemplates riparian proprietorship as requiring a water boundary. An allegation by plaintiff that the party through whom he claims title owned and possessed parcels of land lying on the bay, and that such party had been for thirty years in quiet possession and enjoyment of all riparian rights, does not constitute a sufficient allegation of a riparian proprietorship. As a result plaintiff's injunction was reversed and the case remanded for further proceedings. (Mockler-Florida)  
W73-08228

**ADAMEK V. CITY OF PORT RICHEY (APPLICATION FOR PERMIT TO CONSTRUCT A DOCK).**

214 So. 2d 374-375 (2d D.C.A. Fla. 1968).

Descriptors: \*Florida, \*Judicial decisions, \*Permits, \*Docks, Legal aspects, Regulation, State governments, Engineering structures, Riparian rights, Riparian lands, Legislation, Local governments.  
Identifiers: Corps of Engineers.

Plaintiff riparian landowner sued defendant city for a judgment compelling the issuance of a permanent permit for construction of a dock. The Circuit Court of Pasco County denied summary judgment to the property owner and an interlocutory appeal was taken. The Florida District Court of Appeals held that denial of summary judgment was proper where the ordinance required the owner to obtain the approval of the Army Corps of Engineers as a condition precedent to the issuance of a permanent permit and that the property owner failed to allege that approval of the Corps of Engineers had been obtained. (Mockler-Florida)  
W73-08229

**CARTISH V. SOPER (RESERVATION OF RIPARIAN RIGHTS FOR SUBDIVISION LOT OWNERS).**

157 So. 2d 150-154 (2d D.C.A. Fla. 1963).

Descriptors: \*Florida, \*Legal aspects, \*Riparian land, \*Riparian rights, Water law, Water rights, Remedies, Judicial decisions, Access routes, Easements, Right of way.  
Identifiers: Right of Ingress and egress, Water rights (Non-riparians).

Plaintiff's subdivision lot owners sued to obtain a declaration of their riparian rights and the rights of defendants, owners of lots abutting a private parkway, to the parkway and to enjoin the defendants from obstructing the plaintiff's free use of all parts of the parkway and rebuilding of a dock. The subdivision plat reserved the parkway to allow ingress and egress to an adjacent bay on behalf of all subdivision lot owners. Defendants contend this reservation did not encompass riparian rights. The Florida District Court of Appeals held that riparian rights necessary and incidental to access to the bay were implicit in the plat reservation. Further the court held that the right to build a dock to facilitate the access of the easement holders to the waters was implied. The court thereby affirmed the lower court decision for plaintiffs. (Mockler-Florida)  
W73-08230

**BLOMQVIST V. COUNTY OF ORANGE (LOCAL RESERVOIR CONSTRUCTION SUBJECT TO STATE APPROVAL).**

69 Misc. 2d 1077-1081 (Sup. Ct. N.Y. 1972).

Descriptors: \*Municipal water, \*Judicial decisions, \*Eminent domain, \*New York, \*Reservoir construction, Reservoirs, Condemnation, Reservoir storage, Reservoir sites, Legislation, Planning, Local governments, Water supply

development, State governments, Constitutional law, Legal aspects, Water supply.  
Identifiers: \*Injunction (Prohibitory).

Plaintiff landowners sued to enjoin the defendant county from acquiring land for a reservoir. Plaintiffs contended inter alia that the county had not submitted its maps and plans to the State Water Resources Commission for approval as required by the Conservation Law. Defendant contended that it was not a public corporation within the meaning of that legislative provision. This law gives the State Commission broad regulatory powers over the potable water supply of the entire state. The New York Supreme Court held that a county is a public corporation within the conservation law and defendant must obtain the state commission's approval prior to condemning land for a reservoir. Since defendant has not complied with the requirements of the Conservation law, it is without authority to acquire land for the reservoir. However, the court denied plaintiff's motion for a summary judgment on other grounds. (Smith-Adam-Florida)  
W73-08231

**STATE V. BLACK RIVER PHOSPHATE CO. (TITLE ASSERTION TO SUBMERGED LANDS ON EDGE OF CHANNEL OF NAVIGABLE STREAM).**

13 So. 640-658 (Fla. 1893).

Descriptors: \*Ownership of beds, \*Florida, \*Riparian land, \*Riparian rights, Legal aspects, Beds under water, Judicial decisions, Public rights, High water mark, Navigable rivers.  
Identifiers: Public trust doctrine.

The plaintiff state sued to enjoin the defendant phosphate company from taking phosphates from the bed of a navigable river. Defendant contended that it owned the bed under the Riparian Act of 1856. The court noted that so long as the land remains submerged the governmental control over it is not lost. The Court held for the state, stating that the Riparian Act of 1856 does not vest in riparian owners an unqualified fee in the lands below the high-water mark, and out to the edge of the channel in navigable streams, bays of the sea, or harbors of the state. The court based its decision on the rationale that so long as such submerged lands remained unimproved by the construction of wharves, or unclaimed by filling in from the shore and converting the water into land, the riparian owner, though the legal title is in him, has, insofar as the statute is concerned, no greater right to the beneficial use of such submerged lands and the waters above them than any other citizen, except for the purpose of protecting from invasion the right to improve which the statute gives him. Moreover, the statute was held not to give to the riparian owner the right to take phosphates from the beds of navigable streams, bays of the sea, or harbors, below high-water mark, and out to the edge of the channel, for the purposes of salt. (Mockler-Florida)  
W73-08232

**LITTLE CALUMET RIVER: LAKE CALUMET HARBOR.**

Ill. Ann. Stat. ch. 19 secs 112.1 thru 117 (Smith-Hurd 1972).

Descriptors: \*Illinois, \*Pollution abatement, \*Legislation, \*Water pollution control, Administrative agencies, Management, Water law, Water policy, Water pollution, Water quality, Public health, Harbors, Industries, Water pollution treatment, Legal aspects, Excavation.

The interests of the people of Illinois require that the Little Calumet River be cleaned up. The Commission on Operation Little Calumet River is

## WATER RESOURCES PLANNING—Field 06

### Ecologic Impact of Water Development—Group 6G

established to coordinate the efforts to free the river from pollution. The Commission shall identify the problems relating to the pollution, coordinate efforts of various parties to effectuate a cleanup, develop a handbook of procedures for similar situations and recommend necessary legislation. A harbor is to be constructed in and near Lake Calumet in the City of Chicago. The city is obligated to maintain the harbor at the specified depth. The City of Chicago may grant, lease or convey any land granted the city by this act for industrial manufacturing or harbor purposes, provided that approval is received from the Department of Public Works and Buildings. (Glickman-Florida) W73-08233

#### LEVEL OF LAKE MICHIGAN.

Ill. Ann. Stat. ch. 19 secs 119 thru 120.11 (Smith-Hurd 1972).

Descriptors: \*Water levels, \*Water distribution (Applied), \*Water utilization, \*Illinois, \*Legislation, Water policy, Water sources, Water allocation (Policy), Administrative agencies, Regulation, Control, Water law, Adjudication procedure, Water resources development, Water resources planning, Watershed management, Watersheds (Basins), Water yield, Water supply, Rationing (Water), Lake Michigan, Lakes.

Identifiers: Approved consumptive use, Water rights (Non-riparians).

The Illinois Department of Transportation shall cooperate with federal and other state and local agencies for the regulation and maintenance of the level and use of the waters of Lake Michigan. All necessary data for the formulation of plans and construction of works for the regulation of the water level and water utilization shall be collected by the Department. The Department shall devise a continuing program for the apportionment of water diverted from Lake Michigan, but the amount shall be metered, and shall not exceed a set level. Organizations desiring water shall apply to the Department, who shall consider their needs and other possible sources in allocating the water. Failure to properly use allocated water will result in a hearing to terminate the allocation. The Department shall prescribe reasonable rules relating to control and utilization of water from the Lake Michigan watershed. The Department may contract for any professional services necessary in the proper exercise of its duties under this act. (Glickman-Florida) W73-08234

#### OIL SPILLS CONTROL MANUAL FOR FIRE DEPARTMENTS,

Alpine Geophysical Associates, Inc., Norwood, N.J.

For primary bibliographic entry see Field 05G.

## 6F. Nonstructural Alternatives

#### AN APPRAISAL OF FLOODPLAIN REGULATIONS IN THE STATES OF ILLINOIS, INDIANA, IOWA, MISSOURI, AND OHIO,

Illinois Univ., Urbana. Dept. of Landscape Architecture.

W. M. Keith.

Available from the National Technical Information Service as PB-219 234, \$3.00 in paper copy, \$1.45 in microfiche. Illinois Water Resources Center, Urbana, Termination Report, April 1973. 29 p, 6 fig. OWRR A-030-ILL (2). 14-31-0001-3013.

Descriptors: \*Floodplain zoning, Flood protection, Non-structural alternatives, Floodplain insurance, \*Illinois, \*Indiana, \*Missouri, \*Regulation, Legislation, Zoning.

The objectives were to determine why state statutes and local zoning ordinances are not effectively used in floodplain management, to determine alternative preventive methods available and to analyze the alternatives to determine their suitability for management purposes. The objectives were only partly achieved within the time frame of the study. A repository of enabling legislation, information and inventory reports and ordinances relating to floodplains has been established for Illinois, Indiana, Iowa, Missouri and Ohio. This can be used for monitoring and evaluating changes in regulations and management procedures. An analysis of the floodplain regulations in these five states is presented. It is concluded that local communities are not self-motivated to adopt regulations and require external encouragement. Several areas suitable for regional case studies are identified. A basis for evaluation criteria for a floodplain management program is presented. It is suggested that useful results can be gained through examination of the effectiveness of regional agencies on floodplain management.

W73-07814

W73-07979

LOST CREEK LAKE PROJECT, ROGUE RIVER, OREGON (SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Portland, Ore. For primary bibliographic entry see Field 08A. W73-07980

SNAGGING AND CLEARING PROJECT ON MILL CREEK AT RIPLEY, WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Huntington, W. Va. For primary bibliographic entry see Field 04A. W73-07981

ADMINISTRATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT, PART I. For primary bibliographic entry see Field 06E. W73-07983

ENVIRONMENTAL IMPACT STATEMENTS—A DUTY OF INDEPENDENT INVESTIGATION BY FEDERAL AGENCIES. For primary bibliographic entry see Field 06E. W73-07993

THE ENERGY NEEDS OF THE NATION AND THE COST IN TERMS OF POLLUTION, Atomic Energy Commission, Washington, D.C. J. T. Ramey. Atomic Energy Law Journal, Vol 14, No 1, p 26-58, Spring 1972, 10 fig, 16 ref.

Descriptors: \*Water pollution sources, \*Energy budget, \*Energy dissipation, \*Nuclear energy, Oil, Coal, Natural gas, Electricity, Electric power production, Thermal powerplants, Nuclear powerplants, Hydroelectric plants, Alternative planning, Future planning (Projected), Estimated benefits, Estimated cost, Research and development, Environmental effects, Thermal pollution.

#### 6G. Ecologic Impact of Water Development

#### WALKER BRANCH WATERSHED: A STUDY OF TERRESTRIAL AND AQUATIC SYSTEM INTERACTION,

Oak Ridge National Lab., Tenn.

For primary bibliographic entry see Field 04D. W73-07947

RECTIFICATION OF DEFICIENCIES IN COMPLETED LOCAL PROTECTION PROJECT, WELLSVILLE, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Buffalo, N.Y.

For primary bibliographic entry see Field 08A. W73-07975

BRANTLEY PROJECT, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Denver, Colo.

For primary bibliographic entry see Field 08D. W73-07976

DESALINIZATION PLANTS, VIRGIN ISLANDS (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Department of Housing and Urban Development, San Juan, Puerto Rico. Region II.

For primary bibliographic entry see Field 03A. W73-07977

AGRI-INDUSTRIAL PARK WATER IMPROVEMENTS, SEWAGE TREATMENT FACILITIES, BUSINESS DEVELOPMENT LOAN (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Economic Development Administration, Austin, Tex. Southwestern Region.

For primary bibliographic entry see Field 05D. W73-07978

COPAN LAKE, LITTLE CANEY RIVER, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Tulsa, Okla.

For primary bibliographic entry see Field 08A.

THE YEAR OF SPOILED PORK: COMMENTS ON THE COURT'S EMERGENCE AS AN ENVIRONMENTAL DEFENDER, Florida Univ., Gainesville.

For primary bibliographic entry see Field 05G. W73-07996

ENVIRONMENTAL LAW: STRICT COMPLIANCE WITH PROCEDURAL REQUIREMENTS OF NEPA—THE AGENCIES MUST PLAY BY THE RULES.

For primary bibliographic entry see Field 06E.

## Field 06—WATER RESOURCES PLANNING

### Group 6G—Ecologic Impact of Water Development

W73-07999

#### PRESERVATION AND ENHANCEMENT OF THE AMERICAN FALLS AT NIAGARA.

Interim Report to the International Joint Commission, December 1971. 77 p, 21 plate.

Descriptors: \*New York, \*Environmental effects, \*Aesthetics, \*Scenery, \*International Joint Commission, Rivers and Harbors Act, Legislation, Water quality control, Creativity, Recreation, Erosion control, Flow control, Urbanization, Water levels.

Identifiers: Niagara (New York), American Falls.

Results are summarized of investigation and research authorized under the 1965 Rivers and Harbors Act. The purpose of the study is to consider the nature and extent of measures necessary to preserve and enhance the scenic beauty of American Falls at Niagara, New York. The historical background of the problems is presented the aesthetic factors and physical conditions which must be considered in reaching a solution are discussed. The range of aesthetic and physical options for preserving or enhancing the beauty of the American Falls and for securing the safety of the viewing public are explored. These options are grouped into a few broad alternative courses of action, followed by the Board's conclusions and recommendations. (Mockler-Florida)  
W73-08194

#### THE IMPACT OF THE NATIONAL ENVIRONMENTAL POLICY ACT UPON ADMINISTRATION OF THE FEDERAL POWER ACT.

Land and Water Law Review, Vol 8, No 1, p 93-124, 1973. 32 p, 118 ref.

Descriptors: \*Administrative decisions, \*Federal Power Act, \*Decision making, \*Hydroelectric project licensing, Administrative agencies, Federal project policy, Interstate rivers, Legal aspects, Legislation, Hydroelectric plants, Judicial decisions, Project planning, Environmental effects.

Identifiers: \*National Environmental Policy Act, Environmental impact statement, Administrative regulations, Licenses.

This article discusses the Federal Power Commission's efforts at compliance with the National Environmental Policy Act of 1969 (NEPA), the problems encountered to date, and some of the conflicts to be anticipated. The history and the provisions of the Federal Power Act and NEPA are outlined along with the Commission's regulations formulated to comply with NEPA in light of guidelines established by the Council on Environmental Quality. The impact of recent federal court decisions indicates that the Commission's regulations may violate the requirements of NEPA, especially in regard to the granting or renewing of a license for non-federal hydroelectric projects which affect the navigable waterways or lands of the United States or which develop power for transmission to interstate commerce without filing an environmental impact statement prior to a hearing upon application for a license. It is also possible that the court decisions may require environmental statements by the Commission prior to its issuing orders involving wholesale utility rates, interconnections, and the issuance of certain securities by utilities under the regulation of the Federal Power Commission. (Dunham-Florida)  
W73-08195

#### A SURVEY OF STATE REGULATION OF DREDGE AND FILL OPERATIONS IN NON-NAVIGABLE WATERS.

Florida Univ., Gainesville. School of Law.

For primary bibliographic entry see Field 04A.

W73-08197

THE WATER RESOURCES COUNCIL, National Water Commission, Arlington, Va. For primary bibliographic entry see Field 06E.  
W73-08198

#### DEPARTMENT OF ECOLOGY.

Washington Natural Resources and Recreation Agencies, Olympia.

In: 1972 Annual Report, State of Washington, p 11-14, 1972.

Descriptors: \*Washington, \*Environmental effects, \*Administrative agencies, \*Water management (Applied), Administration, Legal aspects, Recreation, Water quality, Land use, Coasts, Legislation, Water resources development, Government finance, Law enforcement, Oil spills, Planning, Water rights, Flood control, Water quality control, Water pollution control, Water quality standards.

Identifiers: Coastal zone management.

In 1970, three separate state agencies were consolidated into the Washington Department of Ecology to create an environmental quality maintenance department. Information is presented on the Department's new programs, shoreline management, the state environmental policy act, oil spills, water resources, flood control, water quality, air quality, solid waste disposal management plans, and environmental economics. One of the primary issues is the compatibility of environmental concerns and economic needs; near the end of the fiscal year the Department began work on a major undertaking which could, in the future, resolve this environmental-economic issue. The project is an attempt to develop a line of communication which could lead to the issuance of total environmental authorizations. These authorizations would embody the latest technology to meet all environmental requirements while also meeting industry's economic goals. The primary goal of the Department is to balance environmental concerns with public needs. (Mockler-Florida)  
W73-08200

#### REPORT OF THE UNITED NATIONS CONFERENCE ON HUMAN ENVIRONMENT, HELD AT STOCKHOLM, 5-16 JUNE, 1972.

Available from the National Technical Information Service as PB-211 133, \$3.00 in paper copy, \$1.45 in microfiche. United Nations General Assembly Report A/CONF.48/14. July 3, 1972. 144 p, 5 append.

Descriptors: \*United Nations, \*International law, \*International commissions, \*Environmental control, Public health, Environmental engineering, Water resources, Water conservation, Water resources development, Political aspects, Area redevelopment, Urban renewal, Governments, Foreign countries, Environment, International waters, Legislation.

The Conference adopted this report which contains a declaration on the human environment, an action plan for the human environment and an environmental fund. The fund would be in addition to monies which governments made available to development programs. Certain priorities that require urgent and large-scale action include: water supply sources and ocean and sea pollution. Other areas designated top priority action are understanding and controlling man-produced changes in the ecological systems, acceleration of environmentally sound technology, and encouraging broad international distribution of industrial capacity. Emphasis was also placed on new codes of international law and means for better management of the world's property resources. Included are the following resolutions: World Environment Day, nuclear weapons tests, and the next United Nations Conference on the Human Environment. (Beardsley-Florida)  
W73-08203

THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 SAVED FROM 'CRABBED INTERPRETATION', For primary bibliographic entry see Field 06E.  
W73-08208

#### SMALL BOAT HARBOR, KING COVE, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Anchorage, Alaska. For primary bibliographic entry see Field 06D.  
W73-08209

#### SMITHVILLE LAKE, LITTLE PLATTE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Kansas City, Mo. For primary bibliographic entry see Field 06A.  
W73-08210

BACON CREEK WATERSHED, PLYMOUTH AND WOODBURY COUNTIES, IOWA, (FINAL ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 06A.  
W73-08211

#### WALKER DAM IMPOUNDMENT, AQUATIC PLANT CONTROL PROJECT, NEW KENT COUNTY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 05G.  
W73-08212

#### COW CREEK WATERSHED, STEPHENS AND JEFFERSON COUNTIES, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 06A.  
W73-08214

#### CONSTRUCTION OF ARTIFICIAL REEFS IN THE ATLANTIC OCEAN OFF CAPE HENRY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

National Marine Fisheries Service, Beaufort, N.C. Atlantic Coastal Fisheries Center.

Available from the National Technical Information Service as EIS-VA-72-5392-F, \$3.50, in paper copy, \$1.45 in microfiche. October 2, 1972. 23 p, 1 fig.

Descriptors: \*Virginia, \*Fish attractants, \*Environmental effects, \*Reefs, \*Sport fishing, Recreation, Habitat improvement, Aquatic habitats, Fish management, Fish populations, Fishing.

Identifiers: \*Environmental Impact Statements, \*Artificial reefs, \*Cape Henry (Va).

This action consists of the construction of two artificial reefs in the Atlantic Ocean fifteen and thirty miles off Cape Henry, Virginia. The reefs will be built with surplus navy vessels and will cover approximately 80 and 400 acres. The project will create habitats attractive to sport fishes in an area where such habitats do not occur naturally. Underwater observations will be made by the National Marine Fisheries Service to determine changes in the biota on and surrounding the reefs. No significant adverse environmental effects are anticipated as a result of this project. The physical alteration of the ocean that will occur is expected to create new habitats for many types and substantial numbers of marine organisms including game fishes. Other alternative means of increasing game fish population have been considered but are not considered feasible in this particular area. (Mockler-Florida)  
W73-08215

## RESOURCES DATA—Field 07

### Data Acquisition—Group 7B

**WILLOW ISLAND LOCKS AND DAM OHIO RIVER, OHIO AND WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Huntington, W. Va.  
For primary bibliographic entry see Field 08A.  
W73-08216

**DETAILED PROJECT REPORT, INVESTIGATION FOR FLOOD PROTECTION, MUNDAY, TEXAS, BRAZOS RIVER BASIN, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Fort Worth, Tex.  
For primary bibliographic entry see Field 08A.  
W73-08217

**KAHULUI HARBOR WEST BREAKWATER REPAIR, MAUI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Corps of Engineers, Honolulu, Hawaii.  
Pacific Ocean Div.  
For primary bibliographic entry see Field 08A.  
W73-08218

**GILA RIVER BASIN, NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA, DREAMY DRAW DAM, MARICOPA COUNTY, ARIZONA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Los Angeles, Calif.  
For primary bibliographic entry see Field 08A.  
W73-08219

**T OR C WILLIAMSBURG ARROYOS WATERSHED, SIERRA COUNTY, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Soil Conservation Service, Washington, D.C.  
For primary bibliographic entry see Field 08A.  
W73-08220

**PEARL RIVER BASIN, EDINBURG DAM AND LAKE, MISSISSIPPI AND LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Mobile, Ala.  
For primary bibliographic entry see Field 08A.  
W73-08221

**KANAWHA RIVER COMPREHENSIVE BASIN STUDY, NORTH CAROLINA, VIRGINIA, AND WEST VIRGINIA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Ohio River Basin Commission, Cincinnati.  
For primary bibliographic entry see Field 04A.  
W73-08222

**SAN LUIS UNIT, CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.  
For primary bibliographic entry see Field 08A.  
W73-08223

**CACHE RIVER BASIN FEATURE, MISSISSIPPI RIVER AND TRIBUTARIES PROJECT, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Memphis, Tenn.

Available from the National Technical Information Service as EIS-AR-72-5350-F, \$5.75 in paper copy, \$1.45 in microfiche. August 1972. 70 p., 3 plate, 1 map, 1 append.

Descriptors: \*Arkansas, \*Environmental effects, \*Wildlife habitats, \*Fish conservation, River basin development, Wildlife, Flood control, Water control, Recreation, Oak trees, Hickory trees, Waterfowl, Hunting, Flood routing, Eminent domain, Land use, Aesthetics, Fish management.

Identifiers: \*Environmental Impact Statements, \*Cache River Basin (Arkansas), Fish and Wildlife Coordination Act.

This action consists of recommendations to Congress on the modification of the authorized Cache River Basin Project, to acquire approximately 30,000 acres of lands and their development for mitigation of fish and wildlife losses pursuant to general authorities contained in the Fish and Wildlife Coordination Act of 1958. Certain proposed mitigation measures will preserve significant hunting and fishing opportunities; protect biological productivity, aesthetics and other environmental values; and will enhance outdoor recreation opportunities. The Cache River Basin encompasses portions of thirteen counties within the alluvial valley of the Mississippi River in Northeastern Arkansas and Southeastern Missouri. The project itself is for purposes of flood control. (Smith-Adam-Florida)  
W73-08224

## 07. RESOURCES DATA

### 7A. Network Design

**MANAGEMENT MODEL AS A TOOL FOR STUDYING THE WORTH OF DATA,**  
Geological Survey, Arlington, Va. Water Resources Div.  
For primary bibliographic entry see Field 06A.  
W73-07882

**ERRORS OF THE THERMOMETRIC METHOD OF DEPTH DETERMINATION,**  
Akusticheskiy Institut, Moscow (USSR).  
R. D. Sabinin.  
Okeanologiya, Vol 12, No 2, p 285-289, 1972. 1 tab, 2 ref. Translated from Okeanologiya (USSR), Vol 12, No 2, 1972.

Descriptors: \*Instrumentation, \*Thermometers, \*Measurement, \*Depth, Water temperature, Thermocline, Time lag, Sampling, Equations.

Identifiers: \*USSR, Thermometry.

Errors in the thermometric method of depth determination attributable to differing time lags of protected and unprotected thermometers are discussed. Because of the greater time lag of unprotected thermometers, the thermometric method yields depth values that are too low as ambient water temperature increases and too high as temperature decreases. Formulas are derived for computing these errors, and an error estimate is made for reduced instrument depth during exposure of sampling bottles at various depths and for temperature changes caused by internal waves. In the thermocline of the Arabian Sea these errors may exceed 7.6 m, which precludes use of unprotected thermometers or necessitates equalization of the time lags of protected and unprotected thermometers. (Josephson-USGS)  
W73-07911

**LAKE SURVEY CENTER 1972 RESEARCH PROGRAM.**  
National Ocean Survey, Detroit, Mich. Lake Survey Center.  
For primary bibliographic entry see Field 02H.  
W73-08160

**EXPERIMENTAL CURVES AND RATES OF CHANGE FROM PIECEWISE PARABOLIC FITS,**  
Kentucky Univ., Lexington. Dept. of Mathematics.  
P. C. DuChateau, D. L. Nofziger, L. R. Ahuja, and D. Swartzendruber.  
Preprint, Journal Paper No. 4442, Purdue University Agricultural Experiment Station, Lafayette,

Indiana, 1971. 22 p, 3 fig, 3 tab, 18 equ, 5 ref.  
OWRR-B-014-IND (2).

Descriptors: Computer programs, Equations, Hydraulics.

Identifiers: \*Mathematical analysis, \*Data analysis, Sliding parabola, Parabolic splines, Prism method, Form-free curve fitting, Least squares, Nonlinear data, Slope evaluation.

The determination of experimental curves and rates of change for nonlinear data is approached and solved without assuming an artificially restrictive mathematical form for the complete range of the data. This relatively form-free result is achieved by least-squares computer fitting of parabolic segments to short subranges of the experimental data. Two ways of doing this, referred to as the sliding-parabola and parabolic-splines methods, are developed. These are tested on both smooth and scattered data generated basically from the function  $y \pm x/2$ , without and with random error, respectively. For smooth data, the sliding-parabola method is slightly better than the parabolic splines, but in general both are subject to only very small errors, and they are also in good agreement with a previously presented graphical prism method. For scattered data wherein the inherent errors of function and slope evaluation are much increased, the parabolic-splines method is distinctly superior to the sliding parabola. Both methods require only relatively short computing times, on the order of 1 sec for 40 data points, and are of utility for determining nonconstant experimental rates of change and for least-squares curve fitting without specification of a complete-range mathematical curve. (Bell-Cornell)  
W73-08300

**A PROBABILISTIC MODEL FOR STRUCTURING A DRAINAGE NETWORK,**  
Army Project Mobile Army Sensor Systems Test Evaluation and Review Activity, Fort Hood, Tex.  
For primary bibliographic entry see Field 04A.  
W73-08380

### 7B. Data Acquisition

**STUDY OF THE HYDROGEOLOGICAL CONDITIONS OF ALLUVIAL FANS BY MULTIPLE LANDSCAPE AND GEOPHYSICAL METHODS,**  
Moskovskoe Obshchestvo Ispytatelei Prirody (USSR). Geographic Div.  
For primary bibliographic entry see Field 02F.  
W73-07844

**INDICATION OF ROCKS BY DRAINAGE PATTERNS,**  
Moskovskoe Obshchestvo Ispytatelei Prirody (USSR). Geographic Div.  
For primary bibliographic entry see Field 02J.  
W73-07846

**THE USE OF DRAINAGE PATTERNS FOR INTERPRETING THE MORPHOSTRUCTURES OF THE MOSCOW DISTRICT,**  
Moskovskoe Obshchestvo Ispytatelei Prirody (USSR). Geographic Div.  
For primary bibliographic entry see Field 02J.  
W73-07847

**EXTRAPOLATION OF INDICATOR SCHEMES WITHIN SALT MARSHES,**  
Moskovskoe Obshchestvo Ispytatelei Prirody (USSR). Geographic Div.  
For primary bibliographic entry see Field 02H.  
W73-07848

## Field 07—RESOURCES DATA

### Group 7B—Data Acquisition

**AN INEXPENSIVE, RECORDING TIDE GAUGE,**  
Brookhaven National Lab., Upton, N.Y. Dept. of Biology.  
N. R. Tempel.

Limnology and Oceanography, Vol 18, No 1, p 178-180, January 1973. 3 fig, 1 ref.

Descriptors: \*Tides, \*Instrumentation, \*Gaging, \*Gages, \*Water level fluctuations, Data collections, Telemetry, Water levels.  
Identifiers: \*Tide gages.

An inexpensive, recording tide gage was constructed and tested in a small tidal pond on the north shore of Long Island. The instrument costs less than \$50 if a 0-1 mA recorder is already available. (Knapp-USGS)  
W73-07852

**CHANGES IN CLAY MINERAL ASSEMBLAGES BY SAMPLER TYPE,**  
George Washington Univ., Washington, D.C. Dept. of Geology.  
For primary bibliographic entry see Field 02J.  
W73-07868

**A TECHNIQUE USING POROUS CUPS FOR WATER SAMPLING AT ANY DEPTH IN THE UNSATURATED ZONE,**  
Geological Survey, Lubbock, Tex.  
For primary bibliographic entry see Field 02G.  
W73-07901

**ERRORS OF THE THERMOMETRIC METHOD OF DEPTH DETERMINATION,**  
Akusticheskii Institut, Moscow (USSR).  
For primary bibliographic entry see Field 07A.  
W73-07911

**A NEW SIMPLE WATER FLOW SYSTEM FOR ACCURATE CONTINUOUS FLOW TESTS,**  
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).  
A. Gransmo, and S. O. Kollberg.

Water Research, Vol 6, No 12, p 1597-1599, December, 1972. 1 fig, 1 ref.

Descriptors: \*Bioassay, \*Laboratory equipment, \*Design, \*Construction, Flow, Research equipment, Flow rates.  
Identifiers: \*Continuous flow system, Accuracy.

A new simple water flow system is described for use in tests on living organisms in which a continuous controlled flow of water must be utilized. The entire system is made of Perspex plastic. A constant water level is maintained via an overflow and the outlets consist of nozzles screwed onto threaded tubes. By screwing a tube up or down the distance changes and also the velocity of discharge. By this method it is possible to make an adjustment of up to approximately 10 per cent in the rate of flow. Other rates of flow can be obtained simply by replacing the nozzles by other with a cross-section area corresponding to the desired rate. The system can be used for rate of flow ranging from milliliters to liters, and has proved to be accurate and easy to handle. A diagram and description of construction of the water flow system are provided. (Holman-Battelle)  
W73-08022

**SUPPORT-BONDED POLYAROMATIC COPOLYMER STATIONARY PHASES FOR USE IN GAS CHROMATOGRAPHY,**  
Applied Automation, Inc., Bartlesville, Okla. Systems Research Dept.  
E. N. Fuller.

Analytical Chemistry, Vol 44, No 11, p 1747-1753, September 1972. 8 fig, 3 tab, 17 ref.

Descriptors: \*Methodology, \*Gas chromatography, Separation techniques, Chemical analysis, Porous media, Efficiencies, Organic compounds. Identifiers: \*Column preparation, \*Polyaromatic copolymers, \*Chromatography columns, Aliphatic hydrocarbons, Aromatic hydrocarbons, Styrene, Divinylbenzene, Ethylvinylbenzene, Chromatography peaks, Methane, Ethane, Propane, Isobutane, n-Butane, 2-Methylbutane, n-Pentane, Sample preparation.

The preparation of porous polyaromatic copolymers of divinylbenzene, ethylvinylbenzene, and styrene physically bonded to a solid support is described together with initial results illustrating the utility of these materials as GC column packings. While similar in nature to the widely used porous polymer beads, the support-bonded phases provide more rapid separations and greater column efficiency. Experiments showing the effects of cross-linking and of initial dilution with inert solvent on the resulting copolymer product are also discussed. (Long-Battelle)  
W73-08034

**ELECTROCHEMICAL CELL AS A GAS CHROMATOGRAPH-MASS SPECTROMETER INTERFACE,**  
Northgate Lab., Hamden, Conn.  
For primary bibliographic entry see Field 02K.  
W73-08035

**IMPROVED UREA ELECTRODE,**  
Louisiana State Univ., New Orleans. Dept. of Chemistry.  
For primary bibliographic entry see Field 05A.  
W73-08042

**ACTIVITY MEASUREMENTS AT HIGH IONIC STRENGTHS USING HALIDE-SELECTIVE MEMBRANE ELECTRODES,**  
State Univ. of New York, Buffalo. Dept. of Chemistry.  
For primary bibliographic entry see Field 05A.  
W73-08043

**ELECTROCHEMICAL CHARACTERISTICS OF THE GOLD MICROMESH ELECTRODE,**  
Wisconsin Univ., Madison. Dept. of Chemistry.  
For primary bibliographic entry see Field 02K.  
W73-08044

**HYDRAULIC TESTS IN HOLE UAE-3, AMCHITKA ISLAND, ALASKA,**  
Geological Survey, Lakewood, Colo.  
For primary bibliographic entry see Field 04B.  
W73-08071

**INFLUENCE OF 'BOUND' WATER ON THE CALIBRATION OF A NEUTRON MOISTURE METER,**  
Ibadan Univ., (Nigeria). Dept. of Agronomy.  
For primary bibliographic entry see Field 02G.  
W73-08087

**APPLICATION OF RHEOLOGICAL MEASUREMENTS TO DETERMINE LIQUID LIMIT OF SOILS,**  
Central Building Research Inst., Roorkee (India).  
For primary bibliographic entry see Field 02G.  
W73-08089

**AN EXPERIMENTAL STUDY OF THE STRUCTURE, THERMODYNAMICS AND KINETIC BEHAVIOR OF WATER,**  
Midwest Research Inst., Kansas City, Mo.  
For primary bibliographic entry see Field 01A.  
W73-08188

**DEMOUNTABLE RING-DISK ELECTRODE,**  
Illinois Univ., Urbana. School of Chemical Sciences.  
G. W. Harrington, H. A. Laitinen, and V. Trendafilov.  
Analytical Chemistry, Vol 45, No 2, p 433-434, February 1973. 1 fig, 9 ref.

Descriptors: \*Construction, \*Design, \*Methodology, \*Efficiencies, Electrochemistry, Laboratory equipment.  
Identifiers: \*Ring disk electrode, \*Platinum, Sensors, Tin oxide-coated glass, Precision.

Although the ring disk electrode has become a valuable tool in studying many electrochemical processes, there are difficulties in fabricating and centering the electrode. The use of different materials requires fabrication of an entirely new electrode for each material. With the present designs, heat treatment of coated electrodes is impossible. An electrode has been specifically designed to permit the use of different materials for the disk and to eliminate problems associated with centering the electrode. Two platinum disk-platinum ring electrodes were constructed and tested with solutions of Cu (II) in 0.5 M KC1; the results agreed exactly with those published previously. Experimental collection efficiency agreed with the theoretical value of 0.345 within less than 2 percent. The electrodes were disassembled and reassembled several times with no changes in the experimental collection efficiency. The procedure, accompanied by a diagram, is given for constructing such an electrode. A tin oxide-coated glass disk-platinum ring electrode and an electrode in which both disk and ring are of tin oxide-coated glass also are described. (Holman-Battelle)  
W73-08260

**LINEAR AND NONLINEAR SYSTEM CHARACTERISTICS OF CONTROLLED-POTENTIAL ELECTROLYSIS CELLS,**  
California Univ., Livermore. Lawrence Livermore Lab.  
For primary bibliographic entry see Field 02K.  
W73-08261

**AN IMPROVED VARIABLE-INTENSITY SPRINKLING INFILTROMETER,**  
Hebrew Univ., Jerusalem (Israel). Dept. of Soil Science.  
E. Rawitz, M. Margolin, and D. Hillel.  
Soil Sci Soc Am Proc. Vol 36, No 3, p 533-535, 1972. Illus.  
Identifiers: \*Instrumentation, Flow, Infiltration, \*Infiltrometers, Intensity, Movement, Rain, Simulator, Soils, Sprinkling.

Improvements of the Purdue-Wisconsin infiltrometer are described. A winch was added to the tower to facilitate assembly and the windshield was redesigned. Water distribution was improved by changes in the revolving shutter and the surplus water collection trough. The nozzle mounting was simplified, and water level in the vacuum runoff tank was transmitted to an external recorder. Good uniformity was obtained over a wide range of application rates.—Copyright 1972, Biological Abstracts, Inc.  
W73-08340

**APPLICATION OF REMOTE SENSING TO SOLUTION OF ECOLOGICAL PROBLEMS,**  
IBM Federal Systems Div., Bethesda, Md.  
A. Adelman.  
Proc. available from GPO, Washington, DC 20402 - Price \$4.50. In: Space for Mankind's Benefit; Proc. of space congress, November 15-19, 1971, Huntsville, Ala.: Washington, D. C., National Aeronautics and Space Administration Publication NASA SP-313, p 105-106, 1972.

Descriptors: \*Remote sensing, \*Satellites (Artificial), Water resources, Stream gages, Ecology.

## RESOURCES DATA—Field 07

### Date Acquisition—Group 7B

The point of applying remote sensing techniques to the determination of the hydrologic regime of watersheds is twofold: the improvement in predictive accuracy of already instrumented and modeled watersheds and the determination of the hydrologic regimes of as yet unknown watersheds, with potentially significant reductions in time, labor, and cost over present methods. Such a determination is an essential prerequisite for the planning of flood control and water resource utilization works within the watershed. (Knapp-USGS)  
W73-08358

**APPLICATIONS OF REMOTE SENSING TO STREAM DISCHARGE PREDICTION,**  
National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center.  
F. R. Krause, and C. B. Winn.  
Proc available from GPO, Washington, DC 20402. Price \$4.50. In: Space for Mankind's Benefit; Proc of space congress, November 15-19, 1971, Huntsville, Ala: Washington, DC, National Aeronautics and Space Administration Publication NASA SP-313, p 109-119, 1972. 9 fig, 17 ref.

Descriptors: \*Remote sensing, \*Discharge measurement, \*Flood forecasting, \*Streamflow forecasting, Gages, Gaging stations, Data collections, Instrumentation, Mathematical models.

The use of remote earth observations was studied for augmenting stream discharge prediction for the design and/or operation of major reservoir systems, pumping systems, and irrigation systems. The near-term objectives of the feasibility study are the interpolation of sparsely instrumented precipitation surveillance networks and the direct measurement of water loss by evaporation. The first steps of the study covered a survey of existing reservoir systems, stream discharge prediction methods, gage networks and the development of a self-adaptive variation of the Kentucky Watershed model, SNOPSET, that includes snowmelt. As a result of these studies, a special three-channel scanner was designed to provide snow, temperature and water vapor maps for the spatial and temporal interpolation of stream gages. (Knapp-USGS)  
W73-08359

**USE OF DATA FROM SPACE FOR EARTH RESOURCES EXPLORATION AND MANAGEMENT IN ALABAMA,**  
Alabama State Oil and Gas Board, Tuscaloosa.  
P. E. LeMoreaux, and H. R. Henry.  
Proc available from GPO, Washington, DC 20402. Price \$4.50. In: Space for Mankind's Benefit; Proc of space congress, November 15-19, 1971, Huntsville, Ala: Washington, DC, National Aeronautics and Space Administration Publication NASA SP-313, p 143-148, 1972. 3 fig.

Descriptors: \*Remote sensing, \*Resources, \*Alabama, \*Satellites (Artificial), Land resources, Water resources, Data collections, Instrumentation, Surveys.

The University of Alabama, the Geological Survey of Alabama, and the George C. Marshall Space Flight Center are involved in an effort to use remotely sensed, multispectral observations to assess earth resources and environmental quality in Alabama. It is the goal of this effort to interpret these data and provide them in a format which is meaningful to and readily usable by agencies, industries, and individuals throughout the State. Detailed uses considered are flood control, soil studies, resource inventory, surface water studies, mineral exploration, groundwater studies, water temperature studies, growth trends, surveying and mapping, air quality management, water quality management, disaster detection, damage evaluation, sediment transport, traffic studies, erosion control, irrigation, zoning, crop conditions,

recreation, management, urban and regional planning, and pesticide studies. (Knapp-USGS)  
W73-08360

#### A DATA ACQUISITION SYSTEM (DAS) FOR MARINE AND ECOLOGICAL RESEARCH FROM AEROSPACE TECHNOLOGY, Mississippi State Univ., Bay Saint Louis, Mississippi Test Facility.

R. A. Johnson.  
Proc Available from GPO, Washington, DC 20402, Price \$4.50. In: Space for Mankind's Benefit; Proc of space congress, November 15-19, 1971, Huntsville, Ala: Washington, DC, National Aeronautics and Space Administration Publication NASA SP-313, p 149-153, 1972. 3 fig, 2 ref. NASA Grants NGL 25-001-02, 25-001-032, and 25-001-040.

Descriptors: \*Telemetry, \*Data collections, \*Remote sensing, \*Instrumentation, \*Mississippi, Water resources, Ecology, Aircraft, Water pollution, Air pollution.

A self-contained portable data acquisition system was developed for use in marine and ecological research. The compact, lightweight system is capable of recording 14 variables and is suitable for use in either a boat, pickup truck, or light aircraft. Both self-contained analog recording and a telemetry transmitter are used for real-time digital readout and recording. The prototype system has been utilized in several investigations of air pollution and weather modification. It is currently being used on the Mississippi State University Ecosystem Research Project for marine data acquisition. (Knapp-USGS)  
W73-08361

#### SATELLITE OBSERVATIONS OF TEMPORAL TERRESTRIAL FEATURES,

Allied Research Associates, Inc., Concord, Mass. G. Rabchevsky.  
Proc Available from GPO, Washington, DC 20402, Price \$4.50. In: Space for Mankind's Benefit; Proc of space congress, November 15-19, 1971, Huntsville, Ala: Washington, DC, National Aeronautics and Space Administration Publication NASA SP-313, p 155-179, 1972. 34 fig, 1 tab, 37 ref.

Descriptors: \*Remote sensing, \*Satellites (Artificial), \*Data collections, Water temperature, Ocean currents, Sea ice, Snow cover, Snowpacks, Lakes, Reservoirs, Floods, Vegetation effects, Mapping, Surveys, Volcanoes, Playas, Deltas, Sedimentation, Forest, Forest fires.

Since the launch of the first orbiting meteorological Television and Infrared Observation Satellite (TIROS) on April 1, 1960, over 1 million pictures of the earth have been recorded by 25 weather satellites. During the Gemini program, the astronauts took over 2400 color photographs; 2100 pictures were taken during the Apollo Program. Nimbus radiometers sense thermal boundaries of major ocean currents. Some areas of upwelling have been studied in detail. Pack ice boundaries have been established for both polar seas using satellite imagery. Polar (and temperate) ice concentrations can be extracted from satellite data. Changes of the snowline in the upper Missouri-Mississippi River valley were mapped. The seasonal progression of the average surface temperature of Lake Michigan has been obtained using the Nimbus High Resolution Infrared Radiometer. The Nimbus and ITOS television and infrared imaging sensors monitor surface moisture and extent of water bodies. Maps of polar areas have been updated using the Nimbus satellite imagery. Volcanic activity has been recorded by orbital infrared systems. Western U.S. playas have been examined from space. Delta sedimentation plumes have been observed on Nimbus I imagery at the mouth of the Colorado River and at the mouth of the Tigris-Euphrates Rivers. Smoke from large fires in Alaska has been observed on ESSA satellite imagery. (Knapp-USGS)

W73-08362

#### INTERDISCIPLINARY APPLICATIONS AND INTERPRETATIONS OF REMOTELY SENSED DATA, Pennsylvania State Univ., University Park.

G. W. Petersen, and G. J. McMurry.  
Proc Available from GPO, Washington, DC 20402, Price \$4.50. In: Space for Mankind's Benefit; Proc of space congress, November 15-19, 1971, Huntsville, Ala: Washington, DC, National Aeronautics and Space Administration Publication NASA SP-313, p 181-186, 1972. 2 fig, 2 ref.

Descriptors: \*Remote sensing, \*Pennsylvania, \*Resources, Environment, Soils, Surveys, Forests, Data collections, Recreation, Vegetation, Runoff, Geology, Terrain analysis, Land use, Groundwater, Rivers, Air pollution, Acid mine water.

Identifiers: \*Susquehanna River basin.

The use of remote sensing for inventory of natural resources and land use, determination of pollution sources and damage, and analysis of geologic structure and terrain is under investigation. The geographical area of primary interest is the Susquehanna River basin. The specific tasks considered are: identification and characterization of soil; location, inventory, and monitoring of strip-mining spoils; survey and inventory of forest resources; evaluation of potential recreation sites; survey of insect and plant disease epidemics; collection of data for land use management; development of natural resource inventory systems; characterization and analysis of geologic structures and terrain; inventory of mineral resources and mines; detection of groundwater sources from drainage, lineaments, and fracture patterns; determination of runoff; monitoring the environmental effects of power generating plants; detection of sources of acid mine drainage, determination of mixing patterns in surface waters; detection of air pollution damage; and definition and characterization of water quality problems. (Knapp-USGS)  
W73-08363

#### ORBITAL SURVEYS AND STATE RESOURCE MANAGEMENT, Battelle Columbus Labs., Ohio. Aerospace Mechanics Div.

G. Wukelic, T. L. Wells, and B. R. Brace.  
Proc Available from GPO, Washington, DC 20402, Price \$4.50. In: Space for Mankind's Benefit; Proc of space congress, November 15-19, 1971, Huntsville, Ala: Washington, DC, National Aeronautics and Space Administration Publication NASA SP-313, p 187-197, 1972. 15 fig, 4 ref.

Descriptors: \*Remote sensing, \*Ohio, Resources, Surveys, Satellites (Artificial), Data collections, Management.

Ohio, with highly diversified industry, agriculture, and geography, proposes to use orbital survey data and related space capabilities to manage its resources, attack increasing environmental problems, and plan future developments. Short- and long-range benefits are described. The State Government of Ohio foresees opportunities, challenges, and potential benefits in orbital surveys not only for government management responsibility but also for its constituency by providing alternative approaches to resource and environmental problems heretofore unavailable. (Knapp-USGS)  
W73-08364

#### RIVERBED FORMATION, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

M. Skinner.  
Proc Available from GPO, Washington, DC 20402, Price \$4.50. In: Space for Mankind's Benefit; Proc of space congress, November 15-19, 1971, Huntsville, Ala: Washington, DC, National Aeronau-

## Field 07—RESOURCES DATA

### Group 7B—Data Acquisition

tics and Space Administration Publication NASA SP-313, p 199-210, 1972. 9 fig, 20 ref.

Descriptors: \*Remote sensing, \*Aerial photography, \*Channel morphology, \*Drainage patterns (Geologic), \*Alluvial channels, Terrain analysis, Colorado, Beds, Streambeds, River beds, Meanders, Braiding, Erosion, Flood plains, Geomorphology.

The general fluvial processes that work to form a riverbed and produce the characteristic pattern of either meandering, braided, or straight are reviewed. A method for quantification of river pattern and correlation, with the basic hydraulic characteristics of discharge and slope, is presented. Additional characteristics of a river system may be deduced from high-quality photography and imagery obtained from either aircraft or space platforms. (Knapp-USGS) W73-08365

#### DOMESTIC APPLICATIONS FOR AEROSPACE WASTE AND WATER MANAGEMENT TECHNOLOGIES, General Electric Co., Schenectady, N.Y.

F. DiSanto, and R. W. Murray.

Proc Available from GPO, Washington, DC 20402, Price \$4.50. In: Space for Mankind's Benefit; Proc of space congress, November 15-19, 1971, Huntsville, Ala: Washington, DC, National Aeronautics and Space Administration Publication NASA SP-313, p 221-230, 1972. 10 fig, 1 tab, 3 ref.

Descriptors: \*Water management (Applied), \*Research and development, \*Waste treatment, \*Water utilization, \*Water reuse, Technology, Engineering, Systems analysis.

Identifiers: \*Aerospace technology.

Tools for solving many pollution problems have been developed by aerospace technologists. These approaches may be used to identify very complex problems, to select the best solution, and to implement vast programs. None of these approaches or technical processes is unique to the aerospace community. Some of the aerospace developments in solid waste disposal and water purification which are applicable to specific domestic problems are described. An overview is presented of the management techniques used in defining the need, in utilizing the available tools, and in synthesizing a solution. Specifically, several water recovery processes are available for domestic applicability, including filtration, distillation, catalytic oxidation, reverse osmosis, and electrodialysis. Also solids disposal methods include chemical treatment, drying, incineration, and wet oxidation. The latest developments in reducing household water requirements and some concepts for reusing water are outlined. (Knapp-USGS) W73-08366

#### USING LIGHT TO COLLECT AND SEPARATE ZOOPLANKTON, Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

J. L. Ervin, and T. A. Haines.

Prog Fish-Cult. Vol 34, No 3, p 171-174, 1972. Illus.

Identifiers: \*Light, Plankton, \*Zooplankton, Collection device, Design, Construction.

Design and construction details of a zooplankton trap in expensive materials using either 1 or 2 lamps are given. Copyright 1973, Biological Abstracts, Inc. W73-08406

#### THE BOREAL BIOCLIMATES, Toronto Univ., (Ontario). Dept. of Geography.

For primary bibliographic entry see Field 02B.

W73-08437

THE EXPENDABLE BATHYOXYMETER, Oregon State Univ., Corvallis. Dept. of Oceanography.

H. W. Jeter, E. Foya, M. King, and L. I. Gordon. Limnol Oceanogr. Vol 17, No 2, p 288-292. 1972. Illus.

Identifiers: \*Bathyoxymeter, \*Dissolved oxygen, Oxygen, Instrumentation.

A free-fall device is described, analogous to the expendable bathythermograph, which makes dissolved O<sub>2</sub> profiles to 500 m in 80 sec. Copyright 1973, Biological Abstracts, Inc. W73-08438

#### SOLUTE POTENTIALS OF SUCROSE SOLUTIONS, Georgia Univ., Athens. Dept. of Botany.

B. E. Michel.

Plant Physiol. Vol 50, No 1, p 196-198. 1972.

Identifiers: Freezing point depression, Hydrostatic pressure, \*Isopiestic method, Osmometer, Solute potential, Sucrose solutions, Vapor pressure.

Comparative solute potentials were calculated using the isopiestic method, hydrostatic pressure, freezing point depression and a vapor pressure osmometer in an attempt to resolve existing discrepancies in the literature. Copyright 1973, Biological Abstracts, Inc. W73-08450

#### 7C. Evaluation, Processing and Publication

##### A MANUAL ON COLLECTION OF HYDROLOGIC DATA FOR URBAN DRAINAGE DESIGN, Hydrocomp, Inc., Palo Alto, Calif.

R. K. Linsley.

Available from the National Technical Information Service as PB-219 360, \$3.00 paper copy, \$1.45 microfiche. March 1973. 60 p, 8 fig, 2 tab, 15 ref, append. OWRR X-120 (3750) (1).

Descriptors: \*Storm runoff, \*Urban drainage, Precipitation, Evaporation, Solar radiation, \*Storm drains, Water quality, \*Data collections, Management, Publications.

There are very little data on urban storm flow and quality and application of modern methods to urban storm drain management is limited by this lack. This manual is intended to indicate to city and county engineers the types of data which could be gathered by local staff as an aid in the design of future urban runoff management facilities. W73-07801

##### THE USE OF LANDSCAPE-INDICATOR METHODS IN HYDROGEOLOGICAL INVESTIGATIONS, Moskovskoe Obschestvo Ispytatelei Prirody (USSR). Geographic Div.

For primary bibliographic entry see Field 02F. W73-07843

##### STUDY OF THE HYDROGEOLOGICAL CONSTITUTION OF ALLUVIAL FANS BY MULTIPLE LANDSCAPE AND GEOPHYSICAL METHODS, Moskovskoe Obschestvo Ispytatelei Prirody (USSR). Geographic Div.

For primary bibliographic entry see Field 02F. W73-07844

##### LANDSCAPE-INDICATOR INVESTIGATIONS OF KARST, Moskovskoe Obschestvo Ispytatelei Prirody (USSR). Geographic Div.

For primary bibliographic entry see Field 02F. W73-07845

INDICATION OF ROCKS BY DRAINAGE PATTERNS, Moskovskoe Obschestvo Ispytatelei Prirody (USSR). Geographic Div.

For primary bibliographic entry see Field 02J.

W73-07846

NATIONAL PROGRAM FOR MANAGING FLOOD LOSSES, GUIDELINES FOR PREPARATION, TRANSMITTAL, AND DISTRIBUTION OF FLOOD-PRONE AREA MAPS AND PAMPHLETS, Geological Survey, Washington, D.C.

G. W. Edelen, Jr.

Geological Survey open-file report, 1973. 28 p, 7 fig.

Descriptors: \*Floods, \*Flood plains, \*Mapping, \*Flood protection, Reviews, Flood profiles, Data processing, Maps, United States, Aerial photographs, Flood frequency, Boundaries (Surfaces), Flood control, Data transmission, Planning, Governments.

Identifiers: \*Flood-plain mapping guidelines.

Information is presented to assist Water Resources Division offices in preparing flood-prone area maps and pamphlets. Background and history of the program, legal authority, analytical techniques, printing, distribution, and other operational details are discussed. The instructions and advice should be considered primarily as guidelines. In general, the instructions for map bases, lettering sizes, and reproduction requirements must be followed quite closely whereas instructions pertaining to techniques of delineating flood boundaries may require liberal interpretation in unusual situations. The 89th Congress (1966) in House Document 465 recommended preparation of flood-prone area maps to assist in minimizing flood losses by quickly identifying areas of potential flood hazards. Flood-prone area maps produced to date have been particularly useful during floods in planning the evacuation of areas likely to be flooded. (Woodard-USGS) W73-07849

MANAGEMENT MODEL AS A TOOL FOR STUDYING THE WORTH OF DATA, Geological Survey, Arlington, Va. Water Resources Div.

For primary bibliographic entry see Field 06A.

W73-07882

MEASURE OF THREE-DIMENSIONAL DRAINAGE BASIN FORM, Cambridge Univ. (England). Dept. of Geography.

For primary bibliographic entry see Field 02A.

W73-07892

MULTISITE DAILY FLOW GENERATOR, Department of the Environment, Ottawa (Ontario). Water Management Service.

For primary bibliographic entry see Field 02A.

W73-07899

THE TRANSIENT FLOW PROBLEM - A ONE-DIMENSIONAL DIGITAL MODEL, Wyoming Univ., Laramie. Dept. of Civil and Architectural Engineering.

For primary bibliographic entry see Field 02F.

W73-07916

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE ARKANSAS RIVER VALLEY, BENT COUNTY, COLORADO, Geological Survey, Washington, D.C.

R. T. Hurr, and J. E. Moore.

Available for sale by USGS, Washington, D.C. 20242, Price \$1.00 per set. Geological Survey Hydrologic Investigations Atlas HA-461, 1972. 2 sheet, 2 fig, 4 map, 11 ref.

## RESOURCES DATA—Field 07

### Evaluation, Processing and Publication—Group 7C

**Descriptors:** \*Groundwater resources, \*Aquifers, \*Hydrogeology, \*Colorado, Valleys, Rivers, Water wells, Water supply, Water yield, Groundwater recharge, Water levels, Transmissivity, Aquifer characteristics, Irrigation, Hydrologic data, Maps, Groundwater movement.  
**Identifiers:** \*Arkansas River valley (Colo), Bent County (Colo).

This atlas describes the hydrologic characteristics of the valley-fill aquifer in a 36-mile reach of the Arkansas River valley in Bent County, southeastern Colorado. The reach is underlain by saturated valley-fill alluvium consisting of gravel, sand, silt, and clay of Pleistocene to Holocene age. The alluvium occupies a trough eroded in the shale, limestone, and sandstone bedrock of Cretaceous age. In Bent County, the Arkansas River is a gaining stream most of the year owing to groundwater return flow from applied irrigation water. Maximum withdrawals of groundwater in the county occurred in 1964 when about 34,000 acre-feet of water was pumped from 225 irrigation wells and six municipal wells. The yields of the wells range from 100 to 2,500 gpm, and vary considerably from place to place, due mainly to variation in saturated thickness and hydraulic conductivity of the aquifer. The average hydraulic conductivity is about 4,000 gallons per day per square foot. A map of aquifer transmissivity is based on saturated thickness and hydraulic conductivity. (Woodard-USGS)  
W73-08153

#### WATER-RESOURCES RECONNAISSANCE OF THE OZARK PLATEAUS PROVINCE, NORTHERN ARKANSAS, Geological Survey, Washington, D.C.

A. G. Lamonds.

Available for sale by USGS, Washington, D.C. 20242, Price \$1.00 per set. Geological Survey Hydrologic Investigations Atlas HA-383, 1972, 1 sheet, 6 fig, 12 map, 4 tab, 23 ref.

**Descriptors:** \*Water resources, \*Surface waters, \*Groundwater resources, \*Arkansas, Hydrologic data, Water yield, Water quality, Rainfall-runoff relationships, Flow characteristics, Flood frequency, Low flow, Aquifers, Hydrogeology, Aquifer characteristics, Water wells, Water utilization, Geology, Hydrology, Basic data collections.  
**Identifiers:** \*Ozark Plateaus Province (Ark).

This hydrologic atlas describes the water resources of the Ozark Plateaus province in northern Arkansas. The area is underlain by deeply dissected plateaus; the Salem Plateau, the Springfield Plateau, and the Boston Mountains. The Ozark Plateaus in Arkansas encompass all or parts of 22 counties for a total area of about 12,245 square miles. Tributaries to the Arkansas River drain the western and southwestern parts of the plateaus; about 27% of the area. The White River and its tributaries drain about 73% of the area. Geologic units consist mostly of limestone, dolomite, sandstone, and shale. On the basis of geologic and hydrologic similarity, the geologic units are combined into eight hydrologic units. Wells in most of the units generally are less than 300 feet deep and yield less than 10 gpm. The chemical quality of water from 88 springs and wells is summarized. The quality of groundwater generally is suitable for most uses. A map showing flood-frequency regions and hydrologic areas delineates three regions and six areas in the plateaus. The natural quality of surface water is excellent, and pollution is not a serious problem at present (1969). (Woodard-USGS)  
W73-08069

#### ENTROPY AS A MEASURE OF THE AREAL CONCENTRATION OF WATER-ORIENTED INDUSTRY, Tennessee Univ., Knoxville. Coll. of Business Administration.

For primary bibliographic entry see Field 03E.

W73-08131

**SECTION 22, 'SNOW SURVEY AND WATER SUPPLY FORECASTING,' OF THE SCS NATIONAL ENGINEERING HANDBOOK, Soil Conservation Service, Portland, Ore. Water Supply Forecast Unit. For primary bibliographic entry see Field 02C.**  
W73-08153

#### QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART I. NORTH ATLANTIC SLOPE BASINS. Geological Survey, Washington, D.C.

Available from Sup Doc GPO, Washington, DC 20402 Price \$1.75 (paper cover). Geological Survey Water-Supply Paper 2091, 1972, 373 p, 1 fig, 39 ref.

**Descriptors:** \*Water quality, \*Surface waters, \*Northeast U.S., \*Water temperature, \*Sediment transport, Streamflow, Flow rates, Water analysis, Chemical analysis, Water chemistry, Sampling, Basic data collections.  
**Identifiers:** \*North Atlantic Slope basins.

During the water year ending September 30, 1968, the U.S. Geological Survey maintained 175 stations on 117 streams in the North Atlantic Slope basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 128 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 58 and daily at 39 stations. At chemical-quality stations where data are continuously recorded at the stream site (monitors), the records consist of daily maximum, minimum, and mean values for each constituent measured. Quantities of suspended sediment are reported for 33 stations, and particle-size distributions of sediments for 29 stations. Quality of water stations usually are located at or near points on streams where streamflow is measured. (Woodard-USGS)  
W73-08155

#### RECORDS OF WELLS AND TEST BORINGS IN THE SUSQUEHANNA RIVER BASIN, NEW YORK. Geological Survey, Albany, N.Y.

A. D. Randal.  
New York Department of Environmental Conservation Bulletin 69, 1972, 92 p, 3 fig, 2 plate, 5 tab, 6 ref.

**Descriptors:** \*Groundwater resources, \*Water wells, \*Well data, \*Water quality, \*New York, Drillers logs, Aquifer characteristics, Geology, Water levels, Water yield, Water utilization, Chemical analysis, Hydrologic data, Basic data collections.  
**Identifiers:** \*Susquehanna River basin (N.Y.).

Groundwater resources data collected from 1963 through 1968 in the Susquehanna River basin in New York include records of 1,990 wells, chemical analyses of water from 315 wells, detailed logs of 385 wells, and logs of 725 test borings. Well records (except for remarks) and chemical analyses were compiled using automatic data-processing equipment. They are stored by the U.S. Geological Survey on machine cards and magnetic tapes. At least 90% of the records are from the major valleys, which constitute no more than 15% of total basin area. The valleys were emphasized because it is in the valleys that the most productive aquifers occur, most urban development has taken place, and future development is likely to concentrate. A few small upland areas were selected for intensive study. Salt water is known to exist at depth beneath much of the basin. To document its position, salt-water wells were sought and inventoried wherever possible. (Woodard-USGS)  
W73-08159

**GLOSSARY OF TERMS IN SOIL SCIENCE.**  
For primary bibliographic entry see Field 02G.  
W73-08161

**MAP SHOWING GENERAL CHEMICAL QUALITY OF GROUNDWATER IN THE SALINAQUADRANGLE, UTAH.**  
Geological Survey, Washington, D.C.  
D. Price.

Available For Sale by USGS, Washington, D.C. 20242, Price - 75 cents. Geological Survey Miscellaneous Geologic Investigations Maps, Map I-591-K, 1972, 1 sheet, 1 map.

**Descriptors:** \*Water quality, \*Groundwater, \*Dissolved solids, \*Utah, Maps, Locating, Springs, Water wells, Aquifers, Geochemistry, Data collections.  
**Identifiers:** \*Salina quadrangle (Utah).

This map of Salina quadrangle, Utah, scale 1:250,000, shows the general chemical quality of water as determined from quality-of-water data collected by the U.S. Geological Survey and cooperating State, local, and Federal agencies. Sources of data include springs, and wells that tap aquifers at depths of less than 1,000 feet. Various colors are used to indicate locations where dissolved solids range from 250 to 1,000 mg/liter, 500 to 1,000 mg/liter, 500 to 3,000 mg/liter, and 1,000 to 3,000 mg/liter. Also shown are locations where dissolved solids are less than 500 mg/liter. (Woodard-USGS)  
W73-08172

**DRAINAGE AREAS, HARTFORD NORTH QUADRANGLE, CONNECTICUT.**  
Geological Survey, Washington, D.C.  
M. P. Thomas.

Available For Sale by USGS, Washington, D.C. 20242, Price - 75 cents. Geological Survey Miscellaneous Geologic Investigations Maps, Map I-784-J, 1972, 1 sheet, 1 map.

**Descriptors:** \*Drainage area, \*Streams, \*Reservoirs, \*Gaging stations, \*Connecticut, Surface waters, Maps, Streamflow, Discharge measurement, Sampling, Sites, Locating, Watersheds (Divides), River basins, Watersheds (Basins), Cities.  
**Identifiers:** \*Hartford north quadrangle (Conn).

A map scale 1:24,000 shows drainage areas that contribute streamflow to selected sites on streams in the Hartford north quadrangle, Connecticut. In addition to the drainage area boundary markings, the numbers of square miles drained is shown at stream gaging sites, outlets of surface water impoundments, surface water sampling sites, and mouths of tributary streams. (Woodard-USGS)  
W73-08173

**MAP OF DEPOSITS ESPECIALLY SUSCEPTIBLE TO COMPACTION OR SUBSIDENCE, PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO.**  
Geological Survey, Washington, D.C.  
J. O. Maberry.

Available For Sale by USGS, Washington, D.C. 20242, Price - 75 cents. Geological Survey Miscellaneous Geologic Investigations Maps, Map I-770-J, 1972, 1 sheet, 1 map, 1 ref.

**Descriptors:** \*Geology, \*Geologic units, \*Structural engineering, \*Sedimentology, \*Colorado, Subsidence, Settlement (Structural), Physical properties, Loess, Sands, Alluvium, Sedimentation.  
**Identifiers:** \*Arapahoe and Douglas Counties (Colo), Parker quadrangle (Colo).

A map (scale 1:24,000) of Parker quadrangle, Arapahoe and Douglas Counties, Colorado, shows areas of geologic deposits especially susceptible to compaction or subsidence. This information could be important in structural engineering. Colors on the map indicate three different types of geologic

## Field 07—RESOURCES DATA

### Group 7C—Evaluation, Processing and Publication

materials: colluvium (loess), colluvium sand, and alluvium. These units are more susceptible to compaction and subsidence or differential settling than other sediments or sedimentary rocks in the quadrangle. Loess occurs in two broad northwest-trending belts west of Cherry Creek and comprises material brought into the area from the Platte River valley by northwesterly winds. It is as much as 18 feet thick. Colluvium sand covers the land in a belt along the uplands east of Cherry Creek. It was deposited by northwesterly and westerly winds blowing material out of the Cherry Creek valley and is as much as 40 feet thick. The alluvium considered is the post-Piney Creek alluvium, the youngest in the map area. This alluvium occupies the streambeds of Cherry Creek and its major tributaries. It is made up of loose fine to coarse sand and fine gravel with minor amounts of clay. (Woodard-USGS) W73-08174

**THE REGRESSION OF NET RADIATION UPON SOLAR RADIATION,**  
Oregon State Univ., Corvallis. Water Resources Research Inst.  
For primary bibliographic entry see Field 02D.  
W73-08175

**AUTOMATED DATA HANDLING USING A DIGITAL LOGGER,**  
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.  
D. G. Larsen.  
Analytical Chemistry, Vol 45, No 1, p 217-220, January 1973. 4 fig.

Descriptors: \*Digital computers, \*Electronic equipment, \*Data processing, \*Data transmission, Spectrometers, Data storage and retrieval, Design. Identifiers: \*Analog to digital converters, \*Data logger.

Data from analytical instruments requiring little or no control may be input to a small computer. Analog data are fed into a Keithley Model 160 Digital Multimeter whose BCD signal is converted to ASCII code by a coupler driver. This code is then fed to an ASR 33 teletype which produces hard copy and paper tape output. The tape is then used as input to the computer. The data logger has proven to be useful for automating digital data collection from a wide variety of spectrometers and other equipment. The logging speed or data rate is limited to a maximum of one data word per second. The logging system has the advantage of low cost and can be built from commercially available equipment. Schematics of the system are included. (Little-Battelle) W73-08277

**EXPERIMENTAL CURVES AND RATES OF CHANGE FROM PIECEWISE PARABOLIC FITS,**  
Kentucky Univ., Lexington. Dept. of Mathematics.  
For primary bibliographic entry see Field 07A.  
W73-08300

**APPLICATION OF REMOTE SENSING TO SOLUTION OF ECOLOGICAL PROBLEMS,**  
IBM Federal Systems Div., Bethesda, Md.  
For primary bibliographic entry see Field 07B.  
W73-08358

**USE OF DATA FROM SPACE FOR EARTH RESOURCES EXPLORATION AND MANAGEMENT IN ALABAMA,**  
Alabama State Oil and Gas Board, Tuscaloosa.  
For primary bibliographic entry see Field 07B.  
W73-08360

**A DATA ACQUISITION SYSTEM (DAS) FOR MARINE AND ECOLOGICAL RESEARCH FROM AEROSPACE TECHNOLOGY,**  
Mississippi State Univ., Bay Saint Louis. Mississippi Test Facility.  
For primary bibliographic entry see Field 07B.  
W73-08361

**ORBITAL SURVEYS AND STATE RESOURCE MANAGEMENT,**  
Battelle Columbus Labt., Ohio. Aerospace Mechanics Div.  
For primary bibliographic entry see Field 07B.  
W73-08364

**MAP SHOWING APPROXIMATE GROUNDWATER CONDITIONS IN THE PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO,**  
Geological Survey, Washington, D.C.

J. O. Maberry, and E. R. Hampton.  
For sale by USGS, Washington, D.C. 20242, Price - \$0.75. Geological Survey Miscellaneous Geologic Investigations Maps, Map I-770-K, 1972. 1 map, 3 ref.

Descriptors: \*Groundwater resources, \*Aquifer characteristics, \*Water wells, \*Colorado, Mapping, Aquifers, Water yield, Water quality, Water utilization, Hydrologic data, Maps.

Identifiers: \*Arapahoe and Douglas Counties (Colo), Parker quadrangle.

A map (scale 1:24,000) of the Parker quadrangle, Arapahoe and Douglas Counties, Colorado, shows approximate groundwater conditions. Groundwater is obtained principally from three aquifer systems: stream alluvium and alluvial terraces, relatively shallow bedrock, and relatively deep bedrock units. The greatest amounts of readily available groundwater occur in the sand and gravel alluvial fill of Cherry Creek Valley and upland alluvial and terrace deposits of its major distributaries. The alluvium is as much as 150 feet thick in Cherry Creek Valley. Large-capacity wells producing from alluvium along Cherry Creek yield from 900 to 1,800 gpm and average about 1,200 gpm. Most of these wells are used for municipal water supplies. Dissolved solids in water from the alluvium range from 280 to 380 ppm. (Woodard-USGS) W73-08369

**AVAILABILITY OF GROUNDWATER, HARTFORD NORTH QUADRANGLE, CONNECTICUT,**  
Geological Survey, Washington, D.C.

R. B. Ryder.  
For sale by USGS, Washington, D.C. 20242, Price - \$0.75. Geological Survey Miscellaneous Geologic Investigations Maps, Map I-784-K, 1972. 1 sheet, 1 map, 2 ref.

Descriptors: \*Groundwater resources, \*Groundwater availability, \*Aquifer characteristics, \*Water wells, \*Connecticut, Water yield, Water table, Mapping, Sedimentary rocks, Bedrock, Unconsolidated sediments.  
Identifiers: \*Hartford (Conn), North Quadrangle.

Groundwater availability in the Hartford north quadrangle, Connecticut, is shown on a map, scale 1:24,000. Areas in which most individual wells can be expected to yield less than 10 gpm are in deposits of till, very fine sand, silt, and clay as well as sand, gravel, and interbedded sand and gravel with a water-saturated thickness of less than 10 feet. Areas in which most individual wells can be expected to yield between 10 and 200 gpm are in deposits of mostly coarse to fine sand. Unconsolidated deposits are underlain by sedimentary bedrock. Properly developed individual bedrock wells can be expected to yield as much as 600 gpm. Locally, it may be necessary to drill

through less than 500 feet of low-yielding bedrock (traprock) to reach underlying, higher yielding sedimentary bedrock, particularly in the south-central map area. (Woodard-USGS) W73-08370

**A PROBABILISTIC MODEL FOR STRUCTURING A DRAINAGE NETWORK,**  
Army Project Mobile Army Sensor Systems Test Evaluation and Review Activity, Fort Hood, Tex.  
For primary bibliographic entry see Field 04A.  
W73-08380

**SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-1970: PART 6-MISSOURI RIVER BASIN, VOLUME 4-MISSOURI RIVER BASIN BELOW NEBRASKA CITY, NEBRASKA.**  
Geological Survey, Washington, D.C. Water Resources Div.

Geological Survey Water-Supply Paper 2119, 1972. 901 p, 1 map.

Descriptors: \*Streamflow, \*Flow measurement, \*Missouri River, \*Hydrologic data, \*Data collections, Stream gages, Surface waters, Gaging stations, Flow rates, Lakes, Reservoirs, Water levels, Average flow, Low flow, Peak discharge, Crest-stage gages, Colorado, Iowa, Kansas, Missouri, Nebraska.  
Identifiers: \*Missouri River Basin.

This volume of surface water data for the Missouri River basin below Nebraska City, Nebraska, is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1966-70 water years. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS) W73-08381

**AN INVENTORY AND SENSITIVITY ANALYSIS OF DATA REQUIREMENTS FOR AN OXYGEN MANAGEMENT MODEL OF THE CARSON RIVER,**  
Nevada Univ., Reno. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 05B.  
W73-08382

## 08. ENGINEERING WORKS

### 8A. Structures

**RECTIFICATION OF DEFICIENCIES IN COMPLETED LOCAL PROTECTION PROJECT, WELLSVILLE, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as EIS-NY-72-5586-F, \$3.25 in paper copy, \$0.95 in microfiche. February 29, 1972. 22 p, 1 map.

Descriptors: \*New York, \*Environmental effects, \*Flood protection, \*Channel improvement, Flood control, Bank erosion, Fisheries, Flood plain zoning, Erosion control, River regulation, Dredging, Channel flow, Channel erosion, Flow control.  
Identifiers: \*Environmental Impact Statements, \*Wellsville (N.Y.).

## ENGINEERING WORKS—Field 08

### Structures—Group 8A

This project would consist of modifications to the existing channel at Wellsville, New York, to contain flood flows within the river channels at reduced velocities and to decrease future bank erosion to an acceptable level. The project is designed to rectify the deficiencies in the existing completed local flood protection project, and consequently, the area has already experienced substantially all of the environmental impact. However, some further temporary damage will be made to fishery habitats. There are no other known, significant, adverse environmental effects involved. If the project were foregone, extraordinary annual maintenance would continue to be required and the threat of severe flooding would continue. All alternatives to the authorized project, providing equal protection against flooding, are more costly, and would have similar ecological impacts. (Mockler-Florida)  
W73-07975

**BRANTLEY PROJECT, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Bureau of Reclamation, Denver, Colo.  
For primary bibliographic entry see Field 08D.  
W73-07976

**COPAN LAKE, LITTLE CANEY RIVER, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Tulsa, Okla.

Available from the National Technical Information Service as EIS-OK-72-5514-F, \$10.75 in paper copy, \$1.45 in microfiche. July 26, 1972. 90 p., 3 fig., 11 plate, 2 map, 4 photo, 23 tab, 7 chart, 37 ref., 5 append.

Descriptors: \*Water supply, \*Oklahoma, \*Environmental effects, \*Water quality control, \*Flood control, Dam construction, Flood damage, Flow augmentation, Flow control, Flooding, Water quality, Recreation, Economics, Fishing, Land use, Recreation facilities, Wildlife, Impoundments.  
Identifiers: \*Environmental Impact Statements, \*Little Caney River (Okla.).

The proposed dam for Copan Lake will be located on the Little Caney River in Washington County, Oklahoma. The project's purposes are flood control, water supply, water quality control, recreation and fish and wildlife conservation. In the dam site area, the river is a mature meandering stream in a wide valley underlain with thick alluvial materials. The land in the project area is used for cropland, pasture and woodland. The downstream environmental setting will be enhanced by the project. Although wildlife habitats in the normal pool will be lost, the lake will provide an excellent recreational resource. The conservation pool will permanently inundate several thousand acres of land; a number of families will require relocation assistance. The relocation of cemeteries, highways, railroads, county roads, and powerlines will be necessary. Plant and animal species composition will undergo some change in the project area. The following alternatives were considered: diversion, levees, channel improvement, proposed lake, dry lake, upstream multipurpose lakes, and nonstructural measures. (Reed-Florida)  
W73-07979

**LOST CREEK LAKE PROJECT, ROGUE RIVER, OREGON (SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as EIS-OR-72-4666-F-S, \$3.00 in paper copy, \$1.45 in microfiche. May 8, 1972. 11 p., 2 chart.

Descriptors: \*Environmental effects, \*Geologic formations, \*Geologic history, \*Seismic studies,

\*Oregon, Earthquakes, Dams, Rocks, Geologic investigations, Geological surveys, Earthquake engineering, Reservoirs, Reservoir design, River basins, Structural design, Seismic properties, Structural stability, Slope stability, Landslides, Sedimentation, Turbidity.  
Identifiers: \*Environmental Impact Statements, \*Rogue River (Oregon).

This supplement to the environmental impact statement concerns the Lost Creek Lake Project, a reservoir located in the Rogue River Basin in Oregon. A detailed description of project site geology is provided as well as a summary of reservoir slope stability, area seismicity, and possible earthquake effects on the reservoir. The United States is divided into four seismic-probability zones. Lost Creek Dam site is located in an area classified as Zone 1, a relatively quiet seismic area. Structures within Zone 1 are normally designed for an acceleration of .05g. Lost Creek Dam has been designed for 1g, twice the standard design consideration. Reconnaissance data are included on adjacent slopes regarding possible landslides which might be triggered by an earthquake. The reconnaissance did not locate any potential landslides capable of generating destructive waves or of appreciably reducing reservoir use. In a letter of comment, the U.S. Department of the Interior noted that a temporary adverse effect of the project will be the creation of downstream turbidity and sedimentation during construction. Sedimentation would have an adverse effect on anadromous fish if it occurred during the spawning season. (Adams-Florida)  
W73-07980

**CASE HISTORIES OF THREE TUNNEL-SUPPORT FAILURES, CALIFORNIA AQUEDUCT.**  
California State Dept. of Water Resources, Palmdale.  
A. B. Arnold.  
Bulletin of Association of Engineering Geologists, Vol 9, No 3, p 265-299, Summer 1972. 35 p., 18 fig., 1 tab.

Descriptors: \*Collapse, \*Construction practices, \*Geologic formations, \*Tunnels, \*California, Rock mechanics, Tunnel failure, Water tunnels (Conveyance), Ribs, Tunnel construction, Tunnel design, Faults (Geology), Fractures (Geology), Swelling pressure, Tunneling, Joints (Geology), Buckling.  
Identifiers: \*Tunnel supports, \*Rock pressure, Liner supports, Swelling pressure, Shields, California Aqueduct, Squeezing pressures, Carley V Porter Tunnel (California), Castaic Dam, California.

Case histories are presented of steel support system failures in 3 tunnels during construction of the California Aqueduct in Southern California. In the Carley V Porter Tunnel, driven by hydraulic shields, the liner plate supports collapsed during the remilling of claystone lake bed deposits. This area, constructed several feet below grade, had been excavated and supported a year earlier. The steel supports failed in the Castaic Tunnel during the removal of the bench several months after the top heading was holed through. The collapse was in an area of large crown overbreak and steeply dipping sandstone and clay shale. In the Angeles Tunnel, the arch rib and wallplate support system collapsed in a section of faulted and squeezing siltstones and minor sandstones that had been successfully mined about 2 yrs earlier. Ground support sloughed progressively from beneath the wallplate over a period of time prior to the failure. The tunnel support failures were apparently caused by construction practices that did not fully consider geologic conditions. (USBR)  
W73-08059

**BRIDGES, WALLS, FILLS, CHANNEL CHANGES, ETC. (FOR THE INFORMATION**

**OF THOSE INTERESTED IN THE CONSTRUCTION OF).**  
Pennsylvania Dept. of Environmental Resources, Harrisburg.

Form FWWR-23, 1972. 15 p., 5 fig.

Descriptors: \*Bridge construction, \*Land fills, \*Hydraulic structures, \*Hydraulic engineering, \*Pennsylvania, \*Channel improvement, \*Regulations, Legal aspects, Permits, Hydraulic design, Bank protection, Stream improvement, Legislation, Administration, Specifications, Engineering structures, Canal construction, State governments.  
Identifiers: \*Construction requirements.

Information is provided which is necessary for compliance with the rules of the Commonwealth of Pennsylvania concerning the preparation of plans for the construction of certain structures, including bridges, fills, walls along streams, and stream channel changes. Design procedures and sample plans are included, along with general rules for submitting for State approval. Various relevant legislative acts of the Commonwealth are described. (Foerster)  
W73-08182

**WATER AND LAND RESOURCE ACCOMPLISHMENTS, 1971.**  
Bureau of Reclamation, Washington, D.C.

Annual Report on Federal Reclamation Projects, 1971. 70 p., 15 fig., 2 maps, 9 tab, 4 chart.

Descriptors: \*Land reclamation, \*Irrigation, \*Reclamation states, \*Water management (Applied), \*Water supply development, Environmental effects, Water supply, Water pollution control, Federal reclamation law, Irrigated land, Irrigation effects, Municipal water, Industrial water, Recreation, Flood control, Hydroelectric power, Area redevelopment.

For sixty-nine years the Federal Reclamation program has assisted in the management of water resources for the arid West. In 1971 a total of sixteen million people received water service from Reclamation facilities. Accomplishments in irrigation, municipal and industrial water service, hydropower, public recreation, and flood control in 17 western states are described. Moreover, an overview of planning, construction, and research activities and a prospective on the Bureau of Reclamation's future is reported. The industrial impact of construction of Morrow Point Dam and Powerplant in Colorado is described. The purpose of the report is to reflect an overview of the Bureau of Reclamation's role in the Department of the Interior's program of developing and managing natural resources to meet the requirements of present and future societies. Summary data on acreage, yield, production, extension of irrigation to new lands, and the gross value of crops grown on all projects are included. (Mockler-Florida)  
W73-08191

**SMITHVILLE LAKE, LITTLE PLATTE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).**  
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as EIS-MO-72-4723-F, \$4.50, in paper copy, \$1.45 in microfiche. June 16, 1972. 42 p., 2 plate.

Descriptors: \*Water supply, \*Flood control, \*Missouri, \*Environmental effects, \*Water quality control, Flood prevention, Dams, Recreation, Wildlife habitats, Flood plain zoning, Levees, Dikes, Dam construction, Impoundments.  
Identifiers: \*Little Platte River (Mo.), \*Environmental impact statements.

## Field 08—ENGINEERING WORKS

### Group 8A—Structures

This project consists of the construction of a dam and artificial lake on the Little Platte River in Clay and Clinton Counties five miles north of the city limits of Kansas City, Missouri. Desirable environmental effects include flood protection, water supply augmentation, water quality control, and the extensive development of recreational opportunities. Adverse environmental effects include the inundation of 8,040 acres of agricultural land, streams, and fish and wildlife habitat. In addition, the project will cause occasional inundation of up to 4,140 acres of land and the loss of fish and wildlife habitats, in downstream areas. Alternatives to the proposed project include no development at all, a single purpose project for water supply, the development of small flood detention lakes, flood plain zoning, the construction of setback levees, and the obtaining of an adequate water supply through pumping from the Missouri River. (Mockler-Florida)  
W73-08210

#### BACON CREEK WATERSHED, PLYMOUTH AND WOODBURY COUNTIES, IOWA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as EIS-IA-72-537-F, \$3.00 in paper copy, \$1.45 in microfiche. May 1972. 37 p, 1 map, 1 tab.

Descriptors: \*Flood control, \*Sediment control, \*Iowa, \*Environmental effects, \*Watershed management, Water control, Recreation, Fishing, Streams, Reservoirs, Erosion control, Gully erosion, Flood plain zoning, Flood protection, Flood rating, Multiple-purpose projects.

Identifiers: \*Environmental Impact Statements, \*Bacon Creek Watershed (Iowa).

The Bacon Creek, Iowa, Watershed Project consists of conservation land treatment, 31 grade stabilization structures, 5 floodwater retarding and sediment control structures, one multi-purpose recreation and floodwater retarding structure and basic recreational facilities. Approximately 11,000 acres of the 23.3 square mile project area have been treated by installation of conservation cropping systems, waterways and the like. Gully erosion is by far the most significant problem, and it is proposed that accelerated conservation land treatment be provided for all open land still needing treatment. This project will reduce soil erosion and flood damage and provide an artificial lake for recreational activities. However, approximately ten miles of natural stream channel will be inundated and about seven hundred acres of agricultural land and wildlife habitats will be lost to the project. Since the flood plain is already developed, flood plain zoning is not a feasible alternative. Alternatives include no project or land treatment measures without structural measures. (Smith-Adam-Florida)  
W73-08211

#### VIRGINIA BEACH, VIRGINIA—BEACH EROSION CONTROL AND HURRICANE PROTECTION (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Norfolk, Va.

Available from the National Technical Information Service as EIS-VA-72-5322-F, \$3.00 in paper copy, \$1.45 in microfiche. March 6, 1972. 30 p, 2 plate, 1 map, 2 append.

Descriptors: \*Virginia, \*Environmental effects, \*Beach erosion, Water quantity control, Environmental control, Land management, Erosion rates, Erosion control, Recreation, Beaches, Coasts, Shore protection, Concrete structures, Aesthetics. Identifiers: \*Environmental Impact Statements, \*Virginia Beach (Va.).

The Virginia Beach, Virginia, Beach Erosion Control and Hurricane Protection project consists of sheet pile walls capped with concrete, a raising and widening of the beach, and the recommendation of certain non-structural measures. The plan provides for long-term reduction of future damages to structures in the affected area, for reduction in beach erosion, for added recreational opportunities afforded by the extended beach, and for an impetus to economic stimulation of Virginia Beach. Improvement of the socio-economic climate of the community can be expected with the project; also, enhanced recreational potential by preserving the ocean beaches. Adverse environmental effects include the curtailment of the site as an agricultural area, temporary damage to marine life through the use of dredged material from offshore, and visual restriction of seascapes vistas for adjacent residences. (Mockler-Florida)  
W73-08213

#### COW CREEK WATERSHED, STEPHENS AND JEFFERSON COUNTIES, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as EIS-OK-72-5222-F, \$4.50 in paper copy, \$1.45 in microfiche. August 1972. 46 p, 1 map, 1 tab.

Descriptors: \*Oklahoma, \*Environmental effects, \*Flood control, \*Watershed management, \*Erosion control, Flood plain zoning, Recreation, Water management (Applied), Land management, Flood protection, Channel improvement, Stream erosion, Sediment control, Streamflow, Wildlife habitats, Water storage.

Identifiers: \*Cow Creek (Oklahoma), \*Environmental Impact Statements.

This watershed project on Cow Creek, Oklahoma consists of land treatment work, supplemented by 46 floodwater retarding structures, one multipurpose structure with a recreation development, and 2.5 miles of stream channel clearing and snagging. The project will serve to reduce erosion and sediment production on 124,000 acres by 25 per cent, reduce erosion damages to flood plain lands by 56 per cent, reduce floodwater damages on 12,500 acres of flood plain by 70 per cent, and provide a more favorable environment for the residents in and adjacent to the flood plain. Adverse effects include loss of agricultural production on 968 acres covered by sediment pools, loss of 968 acres of game hunting land, and a loss of storage capacity in Lake Texoma. Alternatives include letting the land revert to less intensive uses and developing the flood plain into a publicly owned park or wildlife area. (Mockler-Florida)  
W73-08214

#### WILLOW ISLAND LOCKS AND DAM OHIO RIVER, OHIO AND WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as EIS-OH-72-5278-F, \$5.25, in paper copy, \$1.45 in microfiche. May 16, 1972. 63 p, 3 fig, 1 map, 2 chart.

Descriptors: \*Ohio, \*West Virginia, \*Environmental effects, \*Dam construction, \*Navigation, Impoundments, Locks, Water quality control, Water utilization, Dredging, Spoil banks, Transportation, Ohio River, Dams.

Identifiers: \*Environmental Impact Statements, \*Willow Island (Ohio).

The proposed project would involve the construction and operation of a high-lift, non-navigable, gated dam with a main and an auxiliary lock; removal of three existing locks and dams; dredging required to utilize the new structure; and establish-

ment of public access areas at Willow Island on the Ohio River, Ohio. Favorable impacts includes conversion of pools of three low-lift dams to a single pool, thereby making the reach of the river compatible with other parts of the Ohio River navigation system. However, adverse environmental effects would include the inundation of land along the riverbank and on islands; deposition of spoil on some islands and riverside lands; removal of some trees and shrubs along the shoreline with resultant loss of biotic habitat; and possible modification of dissolved oxygen content in some reaches of the river. Alternatives to the proposed project include modification of existing locks and dams to accommodate larger tows and no action. (Mockler-Florida)  
W73-08216

#### DETAILED PROJECT REPORT, INVESTIGATION FOR FLOOD PROTECTION, MUNDAY, TEXAS, BRAZOS RIVER BASIN, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Fort Worth, Tex.

Available from the National Technical Information Service as PB-2106 460-F \$3.00 in paper copy, \$1.45 in microfiche. April 18, 1972. 28 p, 4 tab.

Descriptors: \*Texas, \*Flood control, \*Environmental effects, \*Flood protection, Eminent domain, Channelling, Channel improvement, Flood plain zoning, Scenery, Trees, Wildlife, Flood routing, Chutes, Diversion structures.

Identifiers: \*Environmental Impact Statements, \*Brazos River Basin (Tex.).

This project would consist of the construction, (on receipt of funds), of a flood control project consisting of a channel, concrete chute, stilling basin, transition sections and bridge replacements in the Brazos River Basin, Knox County, Texas. The impact of the project upon the environment would be minimal. Trees do not exist along the proposed rights of way, and small game, bird-life or fish habitats will not be affected. Although approximately 60 acres of agricultural land would be lost to the project, the advantages of greatly reduced flood damage outweigh those considerations. Comments are included from interested agencies. Alternatives included flood plain zoning and levees, but these were dismissed as only providing minimal benefits, or as being too expensive. (Smith-Adam-Florida)  
W73-08217

#### KAHULUI HARBOR WEST BREAKWATER REPAIR, MAUI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.

Available from the National Technical Information Service as EIS-HI-72-5007-F, \$4.00 paper copy, \$1.45 in microfiche. May 17, 1972. 24 p, 4 plate.

Descriptors: \*Environmental effects, \*Breakwaters, \*Hawaii, \*Harbors, Water resources development, Maintenance, Navigation, Concrete structures, Air pollution, Coral, Dusts.

Identifiers: \*Environmental Impact Statements, \*Maui (Hawaii).

This project consists of maintenance and repair work on the breakwater trunk of the Kahului Harbor West in Maui, Hawaii, the only deepwater port on the island of Maui. It is located approximately 94 miles southeast of Honolulu and is the only existing federal navigation project on the island. The repair work would alter the physical condition of the west breakwater by the placement of 19 and 35-ton concrete units on the seaward slope and the construction of concrete ribs on the cap of the breakwater in order to maintain the continued safe

## ENGINEERING WORKS—Field 08

### Structures—Group 8A

use of the harbor facilities. Although the placement of the concrete components will temporarily disturb the marine environment of the immediate area, no major disruptions to the environment are expected. Air pollution control measures will be implemented to minimize adverse effects; however, some dust will be evident over the coral fill area during construction operations. Alternatives include foregoing repair, constructing a new deep-water harbor on the south shore of the island, or relocating the harbor entrance and redesigning the breakwaters. (Mockler-Florida)  
W73-08218

#### GILA RIVER BASIN, NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA, DREAMY DRAW DAM, MARICOPA COUNTY, ARIZONA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Los Angeles, Calif.

Available from the National Technical Information Service as EIS-AZ-72-4527-F, \$5.50 in paper copy, \$1.45 in microfiche. May 23, 1972. 67 p, 8 fig, 3 photo.

Descriptors: \*Environmental effects, \*Vegetation effects, \*Arizona, \*Flood control, \*Dam construction, Ecology, Dams, Environmental control, Flood protection, Dikes, Impoundments, Spillways, Flood plains, Wildlife habitats.

Identifiers: \*Environmental Impact Statements, \*New River and Phoenix City Streams (Arizona), \*Maricopa County (Arizona).

This project consists of construction of a dam and detention basin, a dike and a spillway in Dreamy Draw, Maricopa County, Arizona. This is an area where urbanization of the flood plain has been so extensive and has encroached upon the narrow drainage bands to such an extent that additional confinement of flood flows is required. The purpose of the project would be to provide protection for the northeastern part of the city of Phoenix from floods originating on the 1.3 square-mile drainage area upstream from the proposed dam. Benefits from redevelopment of presently undeveloped Indian lands near the project area would also accrue from construction of the recommended improvements. Adverse environmental effects include substantial effects on aesthetics unless the improvements are carefully planned and designed to relate to the surrounding environment. Native vegetation and associated animal habitats would be destroyed, a utility line would be moved, and the topography of the project area would be altered. The detention basin would become an area of sediment accumulation instead of sediment production. Alternatives considered included flood plain regulation and various structural alterations. (Mockler-Florida)  
W73-08219

#### T OR C WILLIAMSBURG ARROYOS WATERSHED, SIERRA COUNTY, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as EIS-NM-72-4931-F, \$4.00 in paper copy, \$1.45 in microfiche. May 25, 1972. 35 p, 1 fig, 1 map, 2 tab.

Descriptors: \*Environmental effects, \*New Mexico, \*Watershed management, \*Flood control, Water resources development, Regional development, Land management, Flood protection, Sediment control, Erosion control, Flood damage, Rio Grande River, Flood plains, Flood routing, Land use, Non-structural alternatives.

Identifiers: \*Environmental Impact Statements, \*Sierra County (N.M.).

This proposed watershed project for the T or C Williamsburg Arroyos Watershed in Sierra County, New Mexico, consists of conservation land treatment measures, four flood water retarding structures, construction on one mile of channel and pipeline and .6 mile of floodway. Runoff from high intensity summer rains on the steep, unstable and sparsely vegetated watershed causes the flooding, and sediment outwash from the Arroyos is deposited in the valley in alluvial fans. Favorable environmental effects include a 10% reduction of erosion, a 66% reduction of sediment delivered to the Rio Grande, protection of 300 homes and 60 commercial properties from storm consequences, and a 96% reduction in flood damage to 638 acres of urban land and irrigated cropland. Adverse effects include an elimination of 34 acres of range land to be used for dams and spillways and periodic interruption of agricultural use and wildlife habitat of the 152 acres in the sediment and detention pools. Alternatives considered include public land acquisition of flood prone areas, conservation land treatment measures alone, or flood proofing of existing fixed improvements and zoning the undeveloped areas for open spaces. (Mockler-Florida)  
W73-08220

#### PEARL RIVER BASIN, EDINBURG DAM AND LAKE, MISSISSIPPI AND LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as EIS-MS-72-5331-F, \$9.00, in paper copy, \$1.45 in microfiche. September 1972. 131 p, 1 map, 1 plate.

Descriptors: \*Mississippi, \*Louisiana, \*Environmental effects, \*Multiple-purpose reservoirs, \*Water management (Applied), Reservoirs, Flood control, Flood protection, Water quality control, Recreation, Fishery habitat, Streamflow, Dam construction, Spillways, Flow augmentation, Wildlife habitats, Land use.

Identifiers: \*Environmental Impact Statements, \*Pearl River Basin (Miss.).

This project would authorize the construction of a dam and multiple-purpose reservoir on the Pearl River in Neshoba County, Mississippi, for the purposes of flood control, water quality control, general recreation and fish and wildlife enhancement. Alternatives include no development or construction at alternative sites or single-purpose projects which are less efficacious and economically infeasible. The project would consist of the conversion of 16,000 acres of agricultural and forest lands to a lake environment; loss of free-flowing stream habitat; flood protection and low flow augmentation for water quality control; and high quality recreation. Adverse environmental effects include the loss of 16,000 acres of agricultural and forest land and its associated wildlife habitat as well as the loss of free-flowing stream fisheries and the disruption to inhabitants. (Mockler-Florida)  
W73-08221

#### SAN LUIS UNIT, CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.

Available from the National Technical Information Service as EIS-CA-72-5404-F, \$7.75, in paper copy, \$1.45 in microfiche. October 4, 1972. 113 p, 3 map, 1 chart.

Descriptors: \*California, \*Environmental effects, \*Water supply, \*Irrigation programs, \*Water supply development, Irrigation, Reservoirs, Dams, Drainage systems, Water quality control, Groundwater, Agriculture, Wildlife habitats, Water distribution (Applied).

Identifiers: \*Environmental Impact Statements, \*San Joaquin Valley (Calif.).

This project, the San Luis Unit of the Central Valley Project in California on the west side of the San Joaquin Valley, is designed to deliver supplemental water supplies principally for irrigation of about 600,000 acres of fertile land. The San Luis unit consists of one major dam and reservoir, a forebay dam and reservoir, two detention dams and reservoirs, one pumping plant, two pump generating plants, two major canals, a distribution and drainage collection system, and a major drainage conveyance canal. Alternatives considered included the construction of a desalination plant and a waste water reclamation project. There is a reasonable basis for concern about the possibility of adverse environmental effects from discharging subsurface agricultural drain flows at the western edge of the delta. Desirable effects include supplemental water supplies for 600,000 acres of fertile land to protect and enhance the existing agricultural economy which previously relied heavily on overdraining ground water. (Mockler-Florida)  
W73-08223

#### GEOLOGICAL AND GEHYDROLOGICAL STUDIES FOR ANGOSTURA DAM, CHIAPAS, MEXICO.

Comisión Federal de Electricidad, Mexico City.

C. G. Herrera.

Geological Society of America Bulletin, Vol 84, No 5, p 1733-1742, May 1973. 4 fig, 14 ref.

Descriptors: \*Hydrogeology, \*Karst hydrology, \*Damsites, Fractures (Geologic), Grouting, Dam foundations, Grout curtains, Leakage, Reservoir leakage, \*Mexico.

A high dam is being constructed in the Angostura Canyon 60 km southeast from the city of Tuxtla Gutierrez, the capital of the State of Chiapas, Mexico. Beds of limestone are present, some of which are soluble and karstic within portions of the proposed reservoir area. Study of the leakage potential along the future reservoir's banks was by means of pressure tests in core holes. Packers were used to isolate sections undergoing investigation. Tests were conducted from the bottom of each hole by progressive intervals upward. Within the limits of the reservoir subject to leakage, eight fractures were located on the reservoir's right bank and five on the left bank. The fractures will be treated by grouting from systems of tunnels to be driven at two levels in the plane of the dam's axis and effect a curtain extending 150 to 200 m into each abutment. These tunnels will serve also as drainage galleries to relieve pressures and intercept water that otherwise would bypass the dam. (Knapp-USGS)  
W73-08376

#### BEACH PROTECTION SYSTEM,

N. P. Rasmussen.

U. S. Patent No 3,712,069, 3 p, 8 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 906, No 4, p 1213, January 23, 1973.

Descriptors: \*Patents, \*Shore protection, \*Beach erosion, Waves (Water), Beaches, Coasts, \*Coastal engineering, \*Erosion control.

The beach protection system consists of an upright bulkhead extending along the highwater mark. It is fabricated of flat plates in edge to edge coplanar relationship. The lower section is embedded in the beach. Sand fill is placed on the inland side to the edge of the upper bulkhead. A ramp extends downward to the beach level on the seaward side to resist erosion. A brace is placed between the bulkhead and the ramp to reinforce it against abnormally high tides. (Sinha-OEIS)  
W73-08393

## Field 08—ENGINEERING WORKS

### Group 8B—Hydraulics

#### 8B. Hydraulics

**IDENTIFICATION OF MULTIPLE REACH CHANNEL PARAMETERS,**  
California Univ., Los Angeles, Dept. of Engineering Systems.  
For primary bibliographic entry see Field 02E.  
W73-07887

**OPTIMIZATION OF DEAD END WATER DISTRIBUTION SYSTEMS,**  
Roorkee Univ. (India), Dept. of Civil Engineering.  
For primary bibliographic entry see Field 04A.  
W73-07920

**BOUNDARY EFFECTS ON STABILITY OF STRUCTURES,**  
Uttar Pradesh Irrigation Research Inst., Roorkee (India).

A. S. Chawla.  
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol 98, No HY9, p 1557-1573, Sept 1972. 6 fig, 15 ref, 2 append.

Descriptors: \*Seepage, \*Structural stability, \*Uplift pressure, Water pressure, Bibliographies, Hydraulic structure, Boundary layers, Foundations, Hydraulic gradient, Hydraulics, Permeability, Soil mechanics, Stability, Cutoffs, Mathematical analysis, Confined water, Pervious soils.  
Identifiers: India, Transformations.

Design of hydraulic structures founded on permeable soils of finite depth and with finite or infinite pervious reaches on the upstream and downstream sides is controlled by water seepage under the foundations. Water seeping under such structures exerts pressure on the bottom and tends to wash away supporting soil, often causing extensive damage. An exact solution is presented for determining the exit gradient and uplift pressures on the bottom of such structures. Uplift pressures below the structures increase with an increase in the upstream pervious reach and decrease with an increase in the downstream pervious reach. The value of the exit gradient also increases with an increase in the upstream pervious reach; whereas, it decreases with an increase in the downstream pervious reach. Results have been plotted in easy-to-use curves. (USBR)  
W73-08058

**HYDRAULIC LABORATORY STUDIES OF A 4-FOOT-WIDE WEIR BOX TURNOUT STRUCTURE FOR IRRIGATION USE,**  
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.

U. J. Palde.  
Available from NTIS, Springfield, Va 22151 as PB-213 138, Price \$3.00 printed copy; \$1.45 microfiche. Report REC-ERC-72-31, September 1972. 12 p, 11 fig, 2 tab, 4 ref.

Descriptors: \*Hydraulic models, \*Weirs, \*Turbulence, \*Irrigation design, Model studies, Testing procedures, Baffles, Flow measurement, Hydraulic design, Discharge coefficient, Head loss, Calibrations, Correlation analysis, Design criteria.

A hydraulics laboratory study helped develop the design of a 10-cfs-capacity irrigation weir box structure and determined the head-discharge relationship. A baffle arrangement was developed to adequately distribute the inflow from a circular pipe and provide satisfactory approach flow conditions to the 4-foot-wide measuring weir. Discharge rating calibration was obtained for flows between approximately 2 and 12.5 cfs. The calibration did not agree with accepted equations for suppressed rectangular weirs because of irregular approach flow conditions and the method

of measuring head. A discharge equation was derived by combining the Kindsvater-Carter method with a variable effective head concept which considers the disturbances in the approach flow. (Woodard-USGS)  
W73-08086

**EFFECTIVE HYDRAULIC ROUGHNESS FOR CHANNELS HAVING BED ROUGHNESS DIFFERENT FROM BANK ROUGHNESS,**  
Army Engineer Waterways Experiment Station, Vicksburg, Miss.  
R. G. Cox.  
Miscellaneous Paper H-73-2, February 1973. 52 p, 18 plate, 12 tab, 14 ref, 3 append.

Descriptors: \*Flow resistance, \*Roughness (Hydraulic), \*Channel flow, \*Channel morphology, \*Model studies, Boundaries (Surfaces), Numerical analysis, Laboratory tests, Analytical techniques, Fluid mechanics.  
Identifiers: Channel bed roughness, Channel bank roughness.

Two numerical studies are summarized: one laboratory experimental study, and one analytical study of flow resistance in rectangular channels having one type or degree of boundary roughness on the bed and a second type or degree of roughness on the sidewalls. The numerical study showed that usual procedures for estimating resistance coefficients for channels of this type are not adequate. The laboratory study indicated that the relations between the effective Manning's  $n$ , the sidewall Manning's  $n$ , the bed Manning's  $n$  (the  $n$  values are developed from flow data in channels of single roughness type), and the channel geometry could be established empirically by extensive laboratory testing. The analytical study proved that laboratory studies using a smooth surface for one of its boundaries had little application to practical design problems. The best solution to the problem probably would result by use of hydraulic roughness values to describe the boundary surfaces. (Woodard-USGS)  
W73-08350

#### 8C. Hydraulic Machinery

**SYSTEMS APPROACH TO POWER PLANNING,**  
Bechtel Corp., San Francisco, Calif. Hydro and Community Facilities Div.

J. G. Thon.  
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY4, Proceedings paper 9661, p 589-598, April 1973. 4 fig, 12 ref.

Descriptors: \*Electric power industry, \*Power system operation, Hydraulics, \*Systems analysis, Pumped storage, Thermal powerplants, Planning, Decision making, Mathematical models, Systems engineering.

Identifiers: \*Power loads, Site selection, Load flow, National Power Survey (1970), West Region (U.S.).

The development and use of systems engineering techniques in the power industry are reviewed. The power pools of the West Region of the 1970 National Power Survey are used as background for an analysis of system engineering applications in planning for load growth, the sequential position of various types of generating units under the load curve, and interconnection. The place of pumped storage, thermal electric plant siting, and the expected future shifting role of interconnection to reserve status are reviewed. System techniques are of great value to the power industry in estimating reliability and economic aspects of alternative expansion strategies. They are expected to be of increasing value in evaluating environmental effects of alternative expansion strategies and in in-

teracting with the public and regulating agencies in evaluating the effects of alternative social constraints. (Bell-Cornell)  
W73-07925

#### 8D. Soil Mechanics

**EFFECT OF RESERVOIR FILLING ON STRESSES AND MOVEMENTS IN EARTH AND ROCKFILL DAMS,**  
California Univ., Berkeley, Col. of Engineering.  
For primary bibliographic entry see Field 06D.  
W73-07854

**EFFECT OF RESERVOIR FILLING ON STRESSES AND MOVEMENTS IN EARTH AND ROCKFILL DAMS,**  
California Univ., Berkeley, Col. of Engineering.  
E. S. Nobari, and J. M. Duncan.

Available from NTIS, Springfield, Va. 22151 as AD-745 216. Price \$3.00 printed copy; \$1.45 microfiche. Army Engineer Waterways Experiment Station Contract Report S-72-2, January 1972. 186 p, 72 fig, 9 tab, 50 ref, append. USCE Contract DACW39-68-C-0078.

Descriptors: \*Impoundments, \*Reservoirs, \*Stress analysis, \*Rockfill dams, \*Reviews, Analytical techniques, Evaluation, Engineering structures, Dam foundations, Dam failure, Design criteria, \*Wettablity, Physical properties, Hydrologic data, Hydraulic structures.

The effects of reservoir filling on the stresses and movements in earth and rockfill dams were analyzed. Also included are reviews of the behavior of embankments during reservoir filling, and experimental investigations of the effects of water on the properties of granular materials. Review of the published case histories indicates that reservoir filling has induced significant movements in many well-engineered large dams as well as in small dams. When these movements develop as differential movements in dams and foundations, cracking and consequent erosion and failures have been observed in a number of dams. One of the major factors contributing to the development of differential movements during reservoir filling is the compression due to wetting which occurs in a wide variety of different types of soils. Investigations of the effects of wetting on properties of granular material similar to those used in rock-fill dams showed that moisture had a considerable effect on strength, compressibility, stress-strain, and volume change characteristics of the materials tested. (Knapp-USGS)  
W73-07854

**BRANTLEY PROJECT, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT),**  
Bureau of Reclamation, Denver, Colo.

Available from the National Technical Information Service as EIS-NM-72-5263-F, \$6.50 paper copy, \$1.45 microfiche. 1972. 81 p, 2 map.

Descriptors: \*Dam construction, \*New Mexico, \*Reservoir construction, \*Environmental effects, Dams, Flood control, Recreation, Flood protection, Flood routing, Flood plain zoning, Wildlife habitats, Water control, Sport fishing, Water management (Applied).  
Identifiers: \*Pecos River, \*Environmental Impact Statements.

This project consists of the construction of a concrete and earthfill dam and reservoir on the Pecos River in Eddy County, 24 miles upstream from Carlsbad, New Mexico. The Brantley Reservoir will have a permanent pool of 2,000 acre-feet, will eliminate damage to property and threat to life from floods, will result in a net increase in fishing of about 49,000 man-days per year, and will pro-

## Rock Mechanics and Geology—Group 8E

vide major recreation opportunities. Adverse environmental effects include inundation of an historical site, a loss of approximately 7,000 acres of wildlife habitat, the partial reduction in value of 17,900 acres, and inundation of a 5-mile stretch of the river and contiguous valley lands, including some 2,900 acres of agriculturally productive lands. Alternatives to the project include modification of McMillan and Avalon Dams, dredging of McMillan Reservoir, enlargement of Avalon Dam, and flood plain management projects. Additionally, use of the Carlsbad damsite has been suggested as another alternative. (Mockler-Florida) W73-0796

## ANALYSES OF WACO DAM SLIDE,

Texas Univ., Austin.

S. G. Wright, and J. M. Duncan.

Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, Vol 96, No SM9, p 869-877, Sept 1972. 10 fig, 6 ref, 1 append.

Descriptors: \*Anisotropy, \*Stability analysis, \*Foundation failure, \*Dam failure, Dam foundations, Dam stability, Earth dams, Shale, Safety factors, Foundation investigations, Soil mechanics, Soil investigations, Soil strength, Fissures, Clays, Embankments, Shear strength, Sliding.

Identifiers: Progressive failures, Creep rupture strength, Horizontal movement, Waco Dam (Tex), Failure surfaces, Slip surfaces, Embankment subsidence, Slip-circle method.

Significant influence of the anisotropy of Pepper shale on the failure of Waco Dam shows the importance of considering anisotropy in stability analyses of embankments founded on heavily overconsolidated, stiff-fissured clays and clay shales. During construction of Waco Dam, a 1,500-ft-long section of the 85-ft high embankment slid, producing a failure surface that extended horizontally a considerable distance through the Pepper shale and surfaced about 700 ft downstream from the dam axis. Unconsolidated-drained triaxial tests on the Pepper shale indicated that the strength along an initially horizontal plane was only about 40% of the strength measured in identical tests on vertical specimens. Other tests indicated insignificant strength reduction effects resulting from sustained loading, specimen size, and progressive failure. A stability analysis, which assumed an isotropic, uniform dam foundation with strength values from vertical shale specimens, indicated a safety factor of 1.32 for the most critical circle. When anisotropic soil strengths were used, the safety factor for the new critical circle was reduced to 1.07. Further analyses were made using horizontal failure surfaces through the Pepper shale. (USBR) W73-08062

## STATE-OF-THE-ART REVIEW OF THE DEFINITION OF QUALITY OF A SOIL SAMPLE AND MODERN TECHNIQUES OF SOIL SAMPLING,

Technische Universität, Berlin (West Germany).

H. Mühs.

Proceedings, 7th International Conference on Soil Mechanics and Foundations Engineering, Mexico City, p 104, 1969. German Res Assoc Soil Mech, Tech Univ, Berlin, Rep 27, p 41-51 1971. 9 fig, 4 ref.

Descriptors: \*Sampling, \*Soil investigations, \*Subsurface investigations, Samples, Soil mechanics, Boring, Cores, Soil classifications, Core drilling, Reviews, Soils, Soil properties, Test specimens.

Identifiers: \*Quality levels, \*Soil samplers, Disturbed soils, Swedish foil sampler, Germany, Continuous sample method, Piston samplers, Undisturbed samples, Undisturbed soils, Disturbed samples, Drive samplers.

Classification of soil sample quality should be based on the soil properties that may be accurately determined from the sample rather than on the sampling method. In Germany, the sample quality classification ranges from 1 to 5, depending on the possibility of determining grain size distribution, moisture content, dry density, and shear strength. The quality class obtained is influenced by: (1) boring method, (2) sampling equipment, (3) soil type, and (4) the skill and conscientiousness of the driller. Sampling methods improved after World War II with the Swedish foil sampler which takes continuous cores from 5 to 40 m long and 6.0 to 6.8 cm in dia, but is suitable only for sampling soft soils. The Japanese have developed a modified foil sampler for use in sand and gravel. The Dutch developed 2 continuous core samplers, each having a large inside clearance that fills with fluids to support soft soil and loose sand samples. A third Dutch sampler encases the loose sand sample in a nylon stocking. The German samplers obtain cores 1 m long, and can obtain samples from depths of 40 m in stiff and hard soil. (USBR) W73-08063

## INTERACTION OF SOIL AND POWER PLANTS IN EARTHQUAKES,

Aghabian Associates, Los Angeles, Calif.

J. Isenberg, and S. A. Adam.

Journal of the Power Division, American Society of Civil Engineers, Vol 96, No P02, p 273-291, Oct 1972. 15 fig, 2 tab, 18 ref, 2 append.

Descriptors: \*Structural analysis, \*Finite element method, Foundations, Soil dynamics, Computer models, Mathematical models, Structural behavior, Seismic properties, Nuclear powerplants, Dynamics, Bibliographies, Earthquakes, \*Seismic tests, Earthquake engineering, Seismology.

Identifiers: Soil-structure interaction, Foundation models, Embedment depth, Elastic models, Computer-aided design, Embedded structures, Earthquake loads, Dynamic response, Dynamic loads.

Bedrock motions are generated from a segment of an earthquake record and applied to a 4-layer elastic finite element model of a soil site. Three different finite element models of an embedded nuclear reactor structure (45 ft below and 85 ft above ground surface) are developed. The least refined model is 1-dimensional, having lumped masses, rigidly connected to the soil and subjected to motions found at 45-ft depth in the free field. A second model is identical to the first, except that springs are interposed between the base of the 1-dimensional model and the soil to represent translational and rotational modes of interaction. The most refined model is a 2-dimensional, dynamic, elastic finite element representation of the soil-embedded foundation, walls, containment, and support structures. Analytical results show the importance of using the refined 2-dimensional model. For the structure analyzed, the lowest dynamic response is obtained by the 1-dimensional model without an interaction mechanism. (USBR) W73-08065

## THE ADAPTATION OF CRITICAL STATE SOIL MECHANICS THEORY FOR USE IN FINITE ELEMENTS,

O. C. Zienkiewicz, and D. J. Naylor.

Proceedings Roscoe Memorial Symposium, Stress-Strain Behavior of Soils, Cambridge University, Great Britain, Contribution 1, p 537-547, Mar 1971. 5 fig.

Descriptors: \*Finite element method, \*Soil mechanics, Deformation, Theoretical analysis, Mathematical studies, Computer models, Mathematical analysis, Stress analysis, Plasticity, \*Soil analysis, Saturated soils, Analytical techniques, Mathematical models, Numerical analysis, Plastic deformation, Clays.

Identifiers: Analytical method, Great Britain, Stress-strain curves.

The critical state theory, developed by the late Kenneth Roscoe and his collaborators for modeling the deformational properties of soil, can be adapted for finite elements. The theory, developed for soft saturated clays, appears to have little application to dense clay or granular materials. The critical state theory, one of several nonlinear soil mechanics theories, has appeal because: (1) application can be made to a wide range of materials from soils to metals; (2) unloading can be more realistically simulated; and (3) relatively few parameters can be used to define the soil stress-strain properties. The theory assumes that creep and recoverable shear strains are negligible. An example presented uses the theory to predict triaxial test deformations. (USBR) W73-08066

## SMALL BOAT HARBOR, KING COVE, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Anchorage, Alaska.

Available from the National Technical Information Service as EIS-AK-72-5513-F, \$16.00 in paper copy, \$1.45 in microfiche. May 1972. 38 p, 1 fig, 1 plate, 5 photo, 12 ref, 1 append.

Descriptors: \*Alaska, \*Environmental effects, \*Harbors, \*Navigation, Water quality control, Water pollution, Transportation, Dikes, Shellfish. Identifiers: \*King Cove, Alaska, \*Environmental impact statement.

This small boat harbor project at King Cove, Alaska, consists of an earthfill training dike 1,200 feet long, a rock groin 200 feet long, a dredged entrance channel 400 feet long, and an 11-acre anchorage basin. The project would provide a protected mooring area for resident and transient fishing vessels during foul weather and off-season storage. Alternatives to the proposed project include no development, four alternative harbor sites or configurations, and one alternative quarry site. Adverse environmental effects include the loss of or alteration of 23.8 acres of the marine habitat and concomitantly the loss of shellfish, shellfish habitat, and waterfowl habitat. There will also be a temporary increase in water turbidity in the vicinity of the harbor construction. A long-term degradation of water quality within the confines of the harbor will occur due primarily to low-level chronic pollution. (Mockler-Florida) W73-08209

## 8E. Rock Mechanics and Geology

## CASE HISTORIES OF THREE TUNNEL-SUPPORT FAILURES, CALIFORNIA AQUEDUCT,

California State Dept. of Water Resources, Palm Springs.

For primary bibliographic entry see Field 08A.

W73-08059

## CONTROLLED FAILURE OF HOLLOW ROCK CYLINDERS IN UNIAXIAL COMPRESSION,

James Cook Univ. of North Queensland, Townsville (Australia).

E. T. Brown.

Rock Mechanics, Vol 4, No 1, p 1-24, June 1972. 11 fig, 5 tab, 41 ref.

Descriptors: \*Rock mechanics, \*Compressive strength, Rock tests, Bibliographies, Compression tests, Laboratory tests, Cracks, Stress distribution, Servomechanisms, Failure (Mechanics), Fractures, Finite element method, Stress analysis, Test procedures, Scale effect.

Identifiers: \*Hollow cylinders, \*Uniaxial tests, Uniaxial compression, End restraint, Test results, Platens, Australia, Stress-strain curves, Axial compression, Unconfined compression.

## Field 08—ENGINEERING WORKS

### Group 8E—Rock Mechanics and Geology

Behavior of hollow rock cylinders loaded in uniaxial compression is discussed. Elastic stress distributions calculated by the finite element method showed radial stresses considerably lower in hollow than in solid cylinders, and that the uniformity of stresses can be improved markedly by using loading platens having the same cross section as the specimen. Servocontrolled (stiff) uniaxial compression tests on solid and thick-walled hollow cylinders of white Tennessee marble showed no essential differences in behavior of the 2 specimen types with similar strengths and fracture phenomena being observed. In both servocontrolled (stiff) and conventional machine tests, the progressive formation of large numbers of short subaxial cracks was followed by the development of macrofractures, such as slippage and shearing well past the peak of the stress-strain curve. The similar fracture phenomena observed indicated no extraneous fracture features were introduced by the servocontrolled tests. With few exceptions, the 1-in.-od solid and hollow cylinders were stronger than the 2-in.-od cylinders, suggesting some degree of strength decrease with size increase. (USBR) W73-08064

**MAP OF DEPOSITS ESPECIALLY SUSCEPTIBLE TO COMPACTION OR SUBSIDENCE, PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO.**  
Geological Survey, Washington, D.C.  
For primary bibliographic entry see Field 07C.  
W73-08174

### 8F. Concrete

**SHOTCRETE IN HARD-ROCK TUNNELING,**  
California Univ., Berkeley.  
T. L. Brucke.

Bulletin of the Association of Engineering Geologists, Vol 9, No 3, p 241-264, Summer 1972. 11 figs, 51 ref.

Descriptors: \*Tunnel linings, \*Tunnel construction, Bibliographies, Tunnels, Pneumatic systems, Concrete mixes, Concrete additives, Aggregates, Tunnel design, Economics, Rock properties, Supports, Quality control, Application equipment, Rock mechanics, Tunneling.

Identifiers: \*Sprayed concrete, \*Shotcrete, Tunnel supports, Accelerators, Curing compounds, Underground openings.

Shotcrete and composite systems involving shotcrete, both having proved efficient and economical in stabilizing many types of adverse ground conditions, are widely used for underground openings in all parts of the world. Shotcrete as a material, its contribution to tunnel stability, and method of application to a rock surface, are discussed. Satisfactory shotcrete placement requires proper control of aggregate, cement, and water quality, and the cement and accelerator must be compatible. Two basic methods of bringing the mix to the nozzle for application are as a dry or wet mix. Both methods are described. Experience and ability of the nozzleman greatly affects the mix quality and application. Shotcrete stabilizes tunnel openings by locking together adjacent blocks, thus acting as a reinforcement rather than a support. Although dependable mathematical design criteria are not available, well documented case histories from the U.S. and abroad reveal the circumstances under which shotcrete can contribute to the stability of underground openings. Careful study of these cases by engineering geologists and engineers will aid in using shotcrete correctly. (USBR) W73-08060

### BEHAVIOR OF NONRECTANGULAR BEAMS WITH LIMITED PRESTRESS AFTER FLEXURAL CRACKING,

Leeds Univ. (England).  
E. W. Bennett, and N. Veerasubramanian.

Journal of the American Concrete Institute, Proceedings, Vol 69, No 9, p 533-542, Sept 1972. 8 figs, 3 tab, 6 ref, append.

Descriptors: \*Cracks, \*Deflection, \*Prestressing, \*Prestressed concrete, \*Structural behavior, Beams (Structural), Cracking, Test procedures, Structural design, Laboratory tests, Reinforcing steels, Structural engineering.

Identifiers: \*I-beams, \*T-beams, \*Flexural strength, Test results, Great Britain, India, Prestressed steel, Post-tensioning, Ultimate loads, Pretensioning.

Because of increasing interest in beams with limited prestress, laboratory tests were made to study the flexural behavior after cracking of beams with 4 different cross sections. Deflection, size of cracks, and ultimate strength were studied. The degree to which results obtained from rectangular beams can be applied to beams of nonrectangular sections was also determined. Two methods of calculating the deflection of the beams immediately after cracking were developed and an equation proposed for calculating the width of flexural cracks in beams. Results are compared with current design codes recommended. A numerical example demonstrates both methods of calculating prestressed and nonprestressed reinforcement. (USBR) W73-08067

### WASTEWATER TREATMENT STUDIES IN AGGREGATE AND CONCRETE PRODUCTION,

Smith and Monroe and Gray Engineers, Inc., Lake Oswego, Ore.

For primary bibliographic entry see Field 05D.

W73-08126

### 8G. Materials

#### PHILADELPHIA SUBURBAN WATER COMPANY,

Philadelphia Suburban Water Co., Bryn Mawr, Pa.  
For primary bibliographic entry see Field 05F.

W73-08109

#### DETROIT METRO WATER DEPARTMENT,

Detroit Metro Water Dept., Mich.

For primary bibliographic entry see Field 05F.

W73-08110

#### GEOLOGICAL AND GEHYDROLOGICAL STUDIES FOR ANGOSTURA DAM, CHIAPAS, MEXICO,

Comision Federal de Electricidad, Mexico City.

For primary bibliographic entry see Field 08A.

W73-08376

### 8I. Fisheries Engineering

**EXPERIMENTATION OF AN UNIVERSAL TYPE OF ELECTRIC FISH SCREEN ELECTRONICALLY CONTROLLED, USED TO IMPEDIE FISH PENETRATION IN HYDROPOWER PLANTS, (IN RUMANIAN),**  
Institutul de Cercetari si Proiectari Piscicole, Bucharest (Rumania).

M. Niculescu-Duvaz, D. Matei, T. Tabacopol, C. Onu, and N. Reus.

Stud Cercet Piscic Inst Cercet Proiect Aliment. Vol 4, p 363-381, 1971. Illus. English summary.

Identifiers: Electric fish screens, Experimentation, \*Fish screens, \*Hydropower plants, \*Instrumentation.

The most efficient installations electronically-controlled fish screens are those built by the impulse generator. The construction and mechanical system of this fish management tool is described.—Copyright 1972, Biological Abstracts, Inc.  
W73-08274

### EXPERIMENT IN RAISING COMMERCIAL CARP IN COOLING WATER IN THE ZMIEV AND MIRONOV STATE REGIONAL ELECTRIC POWER PLANTS, (IN RUSSIAN),

V. S. Prosvanyi, Z. A. Makina, and M. N. Mikulina.

Ryba Khoz Resp Mezhdv Temat Nauchn Sb. Vol 13, p 17-19, 1971.

Identifiers: Algae, \*Carp, \*Cooling water, \*Electric power plants, Mironov, Plankton, Retainers, USSR, Zmiev, Zooplankton, Cyanophyta.

Live retainers were put in a warm water discharge canal in the Don fish-raising area. The average 10-day temperature of the water was 25.4-32.0C; during some hours it reached 38 deg C. In the 'Liman'ski' nursery of the Kharkov fish raising concern, net retainers were placed in the Zmiev Reservoir 400 m from a warm water discharge area. The average 10-day temperature varied from 28-29 deg C. The fish fed on granulated food specially prepared for retainer raising. The natural food base was richer in the Zmiev Reservoir. Studies of the use of food showed that yearling carp in net retainers in the Zmiev Reservoir ate zooplankton; in the canal of the Mironov State Regional Electric Power Plant they ate blue-green algae. The consumption of combined food in the 'Liman'ski' fish station was 3.3 g; in the Don fish raising area it was 12.7 g. In the area where the retainers were placed, substantial significance in the effectiveness of retainer raising of carp was obtained.—Copyright 1972, Biological Abstracts, Inc.  
W73-08275

### SOME CHARACTERISTICS OF GENERAL METABOLISM IN CARP YEARLINGS DURING RETAINER RAISING IN WARM WATER, (IN RUSSIAN),

For primary bibliographic entry see Field 05C.

W73-08276

### ROTENONE AND ITS USE IN ERADICATION OF UNDESIRABLE FISH FROM PONDS,

Freshwater Fisheries Research Station, Chandpur (Bangladesh).

For primary bibliographic entry see Field 05B.

W73-08279

### OCTOMITUS TRUTTAE SCHMIDT, A PARASITE OF YOUNG TROUT IN THE FARM FISHPOND JADRO SOLIN, (IN SERBO-CROATIAN),

Pastvako Ribogojilistvo Jadro, Solin (Yugoslavia).

For primary bibliographic entry see Field 05G.

W73-08282

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### WATER RESOURCES RESEARCH PROGRAM,

For primary bibliographic entry see Field 06E.

W73-08001

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Preparation of Reviews—Group 10F

**10. SCIENTIFIC AND  
TECHNICAL INFORMATION**

**10C. Secondary Publication  
And Distribution**

**RESEARCH AND DEVELOPMENT IN-  
PROGRESS, BIOMEDICAL AND ENVIRON-  
MENTAL RESEARCH PROGRAM.**  
Division of Biomedical and Environmental  
Research (AEC), Washington, D.C.  
For primary bibliographic entry see Field 05B.  
W73-07943

**TERRESTRIAL AND FRESHWATER  
RADIOECOLOGY, A SELECTED BIBLIO-  
GRAPHY, SUPPLEMENT 8.**  
Washington State Univ., Pullman. Dept. of Zoolo-  
gy.  
For primary bibliographic entry see Field 05C.  
W73-07962

**10F. Preparation of Reviews**

**STATE-OF-THE-ART REVIEW OF THE  
DEFINITION OF QUALITY OF A SOIL SAM-  
PLE AND MODERN TECHNIQUES OF SOIL  
SAMPLING.**  
Technische Universitaet, Berlin (West Germany).  
For primary bibliographic entry see Field 08D.  
W73-08063

**STATE OF THE ART OF WATER FILTRA-  
TION,**  
American Water Works Association, New York.  
Committee on Filtration Problems.  
For primary bibliographic entry see Field 05F.  
W73-08107

**PHOSPHORUS IN PRIMARY AQUATIC  
PLANTS,**  
University Coll. of North Wales, Menai Bridge.  
Marine Science Labs.  
For primary bibliographic entry see Field 05C.  
W73-08258



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Office of Water Resources Research	W73-07801, 07964	2

## **CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE**

- ▶ Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- ▶ Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- ▶ Eastern United States water law at the College of Law of the University of Florida.
- ▶ Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- ▶ Water resources economics at the Water Resources Center of the University of Wisconsin.
- ▶ Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- ▶ Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- ▶ Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- ▶ Water well construction technology at the National Water Well Association.
- ▶ Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- ▶ Public water supply treatment technology at the American Water Works Association.

### **Supported by the Environmental Protection Agency in cooperation with WRSIC**

- ▶ Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- ▶ Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- ▶ Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- ▶ Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- ▶ Coastal pollution at the Oceanic Research Institute.
- ▶ Water treatment plant waste pollution control at American Water Works Association.
- ▶ Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

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- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
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